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AUG 11 '25

The RIVET-GRIP SYSTEM of BANK VAULT REINFORCEMENT

A HANDBOOK ON THE DESIGN AND CONSTRUCTION OF MODERN BANK VAULTS : : : :

THE RIVET-GRIP STEEL CO., Cleveland, O.
Formerly The Concrete Reinforcing & Engineering Co.

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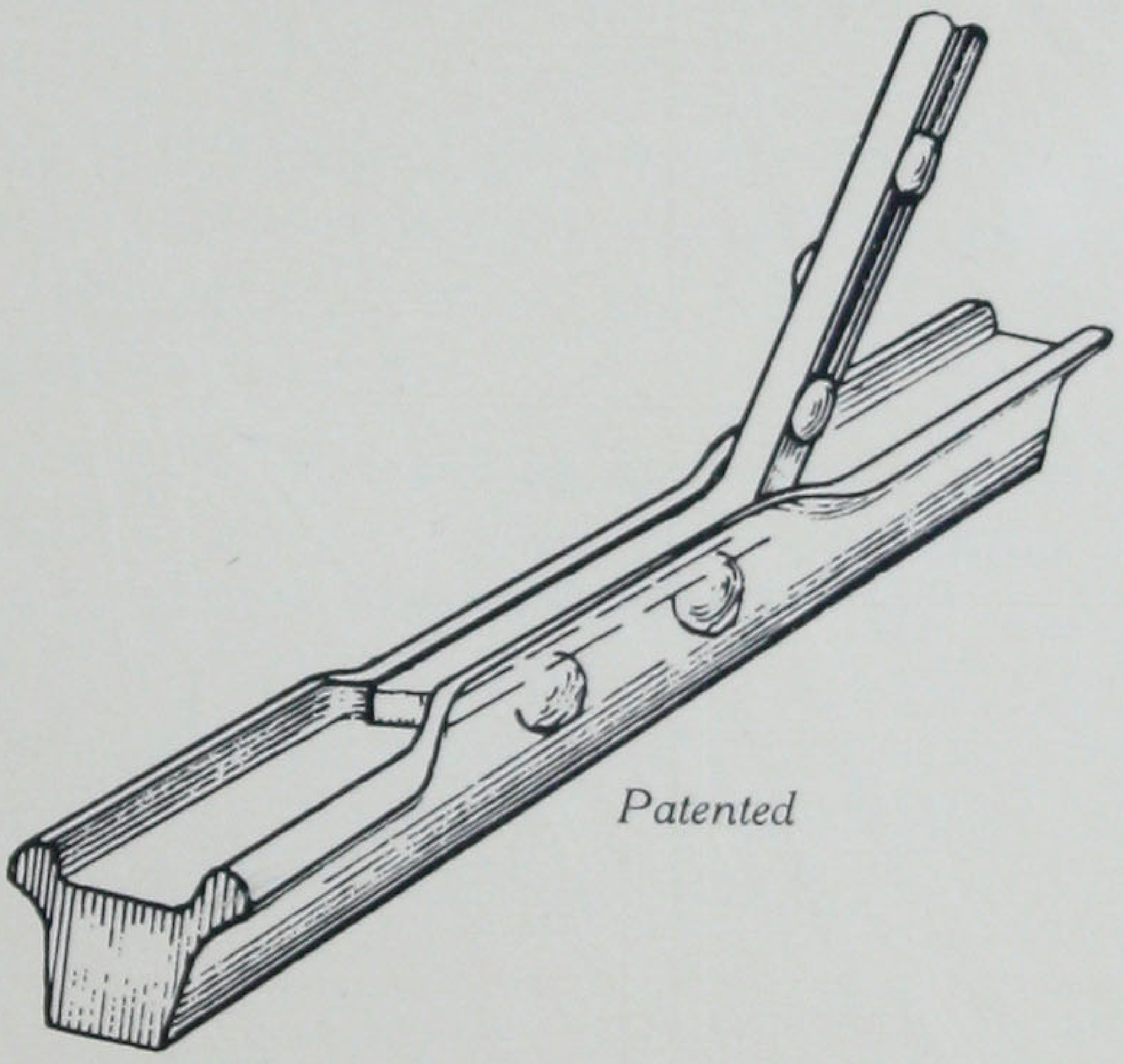
The Rivet-Grip



"Stronger Than The Diagonal"

Copyright 1924
by
The Rivet-Grip Steel Co.

RIVET-GRIP

INSURES

VAULT SECURITY

NO ONE would think of putting a 20 inch vault door at one end of a vault and a 3 inch door at the other. Absurd as this may seem, there are today thousands of bank vaults equipped with heavy, strong doors whose walls plus the lining have only a small fraction of the protective strength of their doors.

The first requisite of a secure vault is, *Balanced Protection*—equal protective strength throughout. The walls, floor and roof of a vault should offer as much protection as its doors.

To obtain this balanced protection, to insure a scientifically correct design of your vaults, to keep abreast of modern developments of vault attacks, and research in effective resistance to such attacks, we have dedicated our efforts in the past several years in developing the RIVET-GRIP SYSTEM of BALANCED VAULT PROTECTION.

THE
RIVET-GRIP
STEEL
CO.

2735 Prospect Ave.
CLEVELAND, OHIO

Formerly The Concrete Reinforcing & Engineering Co.

History and Development of the Rivet-Grip System

In 1920 some tests were conducted at the Bureau of Standards in Washington, D. C., on all types of vault reinforcement in common use at that time, to determine their respective merits for use for the proposed Federal Reserve Bank vaults.

These tests showed that Vault Walls as commonly built were woefully weak and could be penetrated in a very short time by the use of ordinary modern appliances, and that better types of vault wall reinforcement had to be developed.

Federal Reserve Bank Architects and Vault Engineers, who witnessed these tests, were invited to submit new designs of vault wall construction for another and more comprehensive series of tests to be conducted at Sandy Hook, New Jersey, in the Fall of 1921.

The RIVET-GRIP vault walls tested at Sandy Hook were identical in every detail with vault walls since built for a number of Federal Reserve Banks. Not one of the other walls, which approximated in resistance the RIVET-GRIP walls, has since been built for a bank as it was built for the tests. All of the other test walls had a number of expensive and complicated features incorporated to increase their resistance in the tests, but these features could not be and have not been duplicated in an actual vault since built, on account of construction difficulties and prohibitive costs.

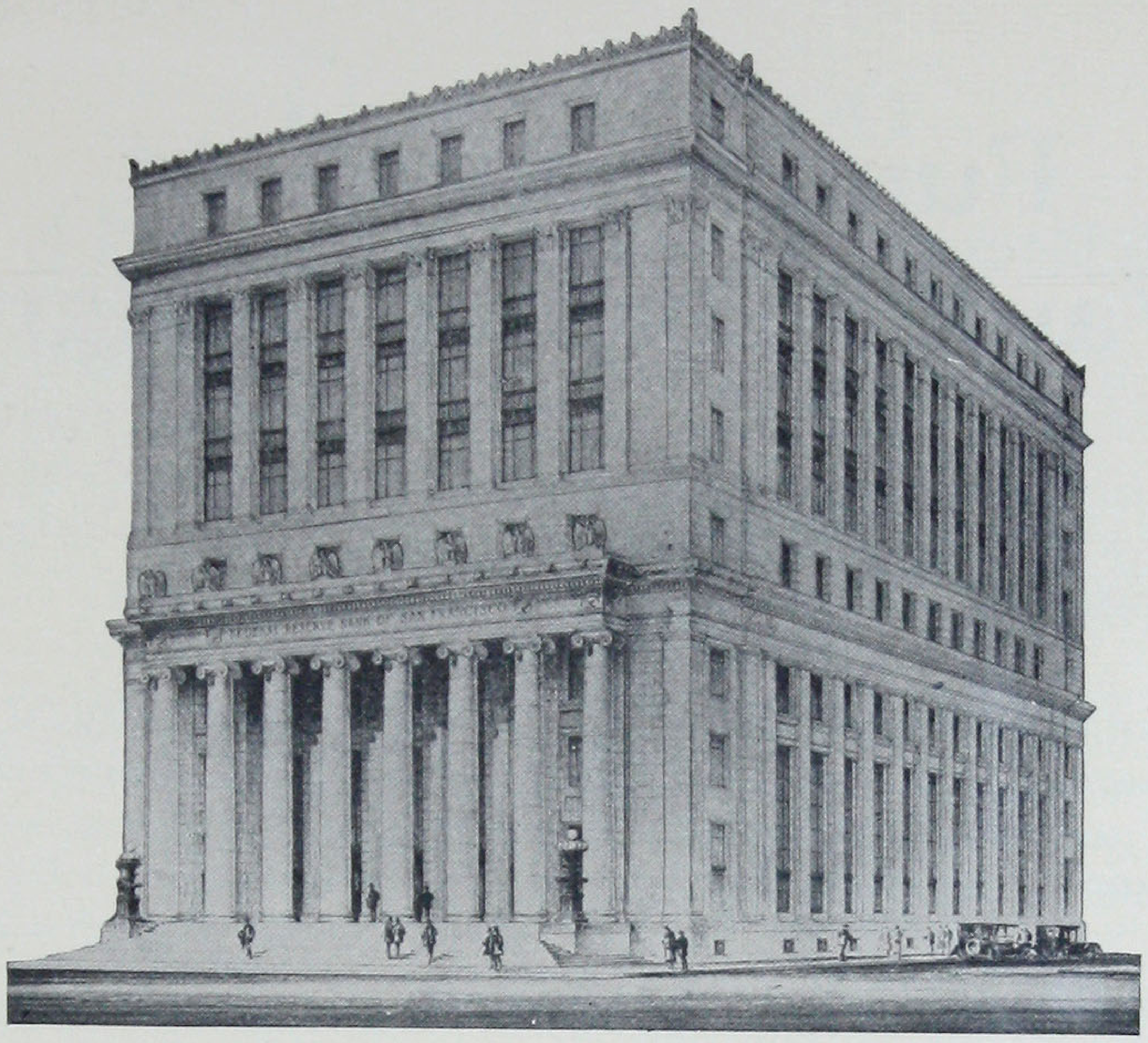
OF ALL THE VAULT WALLS TESTED AT SANDY HOOK AND SINCE ADOPTED AND BUILT COMMERCIALLY FOR BANKS IN EXACT DUPLICATION OF THE TEST WALLS—THE RIVET-GRIP VAULT WALLS RESISTED PENETRATION LONGEST AND MOST EFFECTIVELY:

It is significant that the following seven Federal Reserve Banks adopted the RIVET-GRIP SYSTEM of Vault Reinforcement after personally witnessing or studying the results of Sandy Hook tests:—

The Federal Reserve Bank in CLEVELAND.
The Federal Reserve Bank in PITTSBURGH.
The Federal Reserve Bank in ST. LOUIS.
The Federal Reserve Bank in SAN FRANCISCO.
The Federal Reserve Bank in MINNEAPOLIS
The Federal Reserve Bank in LOUISVILLE.
The Federal Reserve Bank in LITTLE ROCK.

The same skill and study, which was applied in the successful solution of Federal Reserve Vault problems, has been applied to the development of a modern reinforcement for use in vaults built for other banking institutions of every type and size. As a consequence the various types of reinforcement offered in this catalog, all contain the same essential fundamental features and details of design which established the superiority and proved the merits and economy of the RIVET-GRIP SYSTEM in severe competitive tests.

THE RIVET-GRIP SYSTEM OF REINFORCEMENT



G. W. Kelham, Architect

THE SAN FRANCISCO FEDERAL RESERVE BANK

Walker & Weeks, Architects

THE CLEVELAND FEDERAL RESERVE BANK

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

Fundamentals of Vault Masonry Design

Leading Vault Engineers agree that Reinforced Concrete is the ideal material for bank vault masonry, provided it has the following fundamental features in order to effectively retard and resist penetration.

1. Proper disposition of a sufficient amount of steel in the concrete, so as to make the entire masonry mass act as a monolithic unit equally strong at all points.
2. Reinforcement should interlock at corners, and at intersections of walls and slabs.
3. A basket weave arrangement of relatively heavy steel bars set near the outer surfaces of the concrete masonry so disposed as to stop the initial penetration of steel drills.
4. Alternate rows of relatively heavy steel bars arranged thru the full thickness of the concrete masonry to stop successive penetration of the drills.
5. An interlacing of steel ties thru the full thickness of the concrete masonry to effectively absorb the shock of explosives.
6. A rigid attachment of ties or stirrups to the main bars, at close intervals, so as to prevent removal of main bars after same have been cut by burning, and to prevent blowing out of extensive sections of concrete and steel by explosives.
7. Such disposition of a given amount of steel so arranged as to clog the attacking drills, force frequent changes in mode of attack, and cause the greatest amount of work and loss of time for a given penetration.
8. A large proportion of heavy steel bars to resist explosive impact and prevent penetration by the use of ordinary cold cutting tools.
9. A system of reinforcement which will combine all of the above features, without prohibitive initial cost or field handling cost, and one which will allow ease in pouring concrete without clogging.

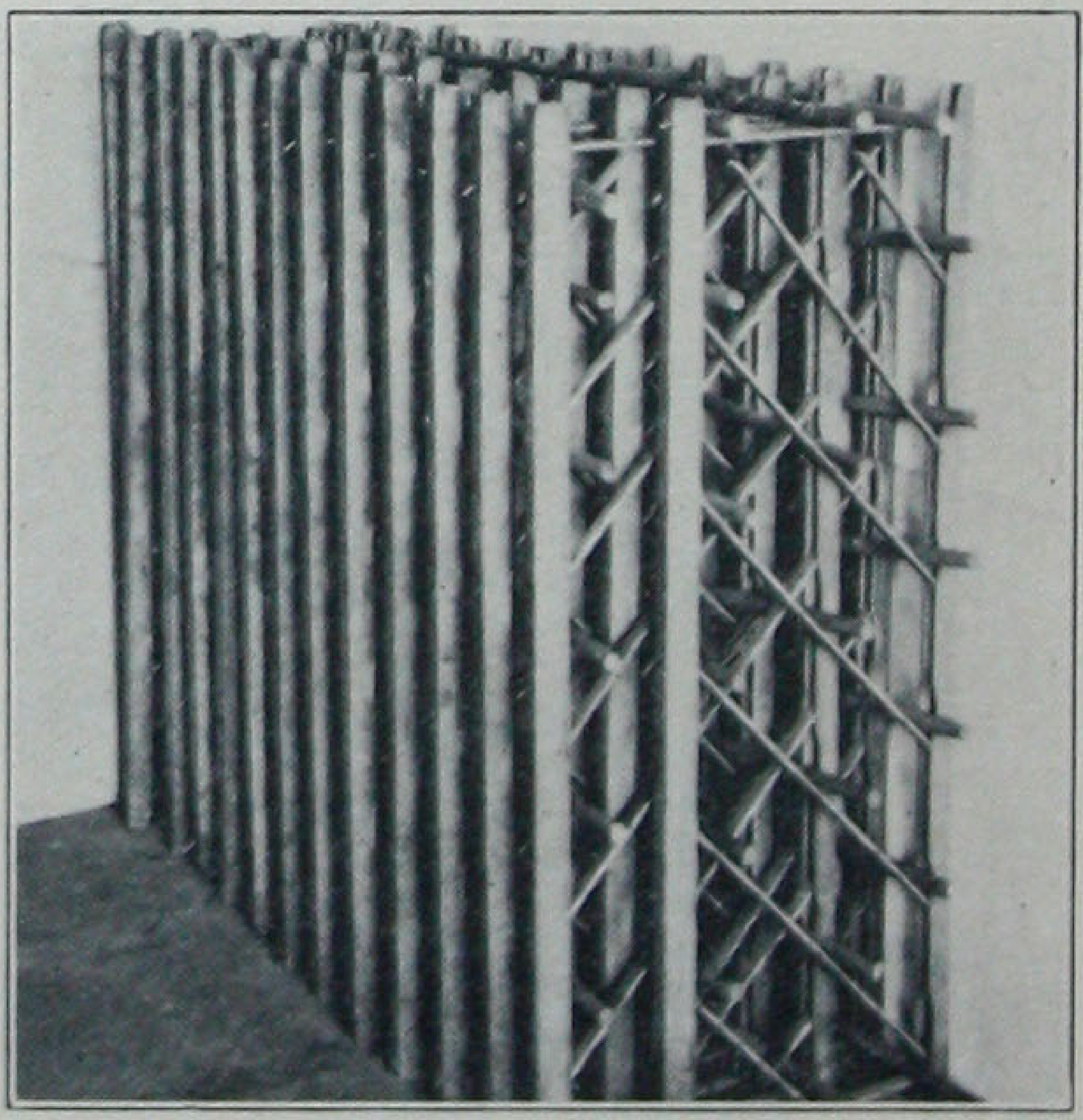


Illustration shows Rivet-Grip Reinforcement Type B-763—2½″ spacing of frames. An 18″ concrete wall with this reinforcement will take a No. 10 Insurance Rating without a lining.

With the above fundamentals in mind and after careful study and extensive tests, we present in the following pages a system of special vault reinforcement which meets fully the above requirements.

Description of the Rivet-Grip System

The RIVET-GRIP SYSTEM consists of an interlocking network of shop fabricated frames and plain round bars, embedded and interlaced through practically the full thickness of the concrete work.

The RIVET-GRIP frames or units are made up of two parallel heavy RIVET-GRIP sections joined at close intervals by lighter RIVET-GRIP diagonal sections, which form the webs of the frames. Where two sizes of main parallel members are used, the heavier section is always placed toward the outer surface of walls and slabs.

The diagonal sections or web tie members are gripped so rigidly, to the heavy main sections of the frames, that the diagonals will break in tension before loosening at the grip. The grip is produced by using a 30 ton pressure to force the metal in the main members around knobs on the web diagonals, securely joining these members together.

The loose bars are laced through the frames perpendicular to the plane of the web members. They are automatically held in position at the intersections of main and diagonal members and need not be wired.

All RIVET-GRIP SYSTEM Reinforcement is accurately shop fabricated, comes to the job true to detail, and conforms to the design in every respect.

Reasons Why

—The RIVET-GRIP SYSTEM has been proven impregnable to burglarious methods of attack and most effective in retarding and resisting penetration in tests made by the best equipment and methods known to modern science and conducted under conditions simulating an attack by a mob in time of anarchy or riot.

1. To penetrate the combination of interlaced heavy RIVET-GRIP steel frames and concrete requires a great variety of equipment and forces frequent changes in attacking operations.
2. In order to make any impression on a RIVET-GRIP wall concrete drills, both hand and pneumatic, are required to penetrate the concrete, explosives are required to break up the concrete, chipping tools must be used to loosen the concrete from the steel, and cutting torches, along with the accessory oxygen and acetylene tanks, are necessary to cut the heavy RIVET-GRIP Sections.
3. The disposition of steel in a RIVET-GRIP wall is such that the preceding operations all have to be repeated many times throughout the thickness of the wall, thus causing great delay and requiring a long period of time during every stage of an attack.
4. The special RIVET-GRIP channel sections are hard to burn as concrete adheres tenaciously to the steel within the channel.
5. Closely spaced fabricated units prevent effective use of tools in chipping and cutting the concrete, or in effecting penetration by drilling.
6. Rigidly attached stirrups, anchoring main bars in the concrete, prevent the removal of large sections of steel.
7. An explosive charge will not break and blow out sections of the heavy bars anchored by the RIVET-GRIP method.
8. Stirrups or diagonal ties interlaced in every direction, prevent the breaking up and blowing out of large pieces of concrete.
9. The main RIVET-GRIP Sections cannot be cut by cold cutting tools.
10. The RIVET-GRIP frames or units interlock at all corners, and intersections of walls and slabs.
11. With the RIVET-GRIP SYSTEM, the full thickness of wall is reinforced—giving maximum effectiveness in a minimum of space.
12. The arrangement of main bars and stirrups allows the pouring of a good sound concrete wall.

Advantages of the Rivet-Grip System

Balanced Protection—

Vault construction development in the past was peculiarly unbalanced. A great amount of progress was made in attaining efficiency in vault doors, and other vault equipment. However, in many cases, these expensive features were used in conjunction with ordinary masonry walls, the development of which had been greatly neglected. Through the use of the RIVET-GRIP SYSTEM, the protective value of walls is made equal to any other individual feature, thus producing a vault which is equally strong at all points and assures the ideal condition in vault constructon—Balanced Protection.

Proper Design—

The RIVET-GRIP SYSTEM of Bank vault reinforcement was developed by an able staff of engineers, upon completion of a great amount of research work, and comprehensive and exhaustive study. Tests and observations of RIVET-GRIP in the field, have proven that their theories are correct, and that the design expressed in the RIVET-GRIP SYSTEM meets all the requirements and fundamentals of good vault design.

Structural Strength—

RIVET-GRIP frames, in addition to their protective features, form an efficient reinforcement, and allow vault walls and slabs to be designed for carrying heavy building columns or other external loads.

Strong Door Connections—

This system allows the design of door connections that are as strong as any other portion of the vault.

Flexibility of Arrangement—

RIVET-GRIP frames or units can be made up in many shapes or forms other than those shown in this catalogue. The spacing and general arrangment can always be varied at will.

Ease of Installation—

All material is completely shop fabricated ready to place before shipping. No cutting bending or fitting has to be done at the job, so that field labor is reduced to the minimum. Ordinary building workmen can do the work of installation quickly and accurately.

Lowest Insurance Ratings—

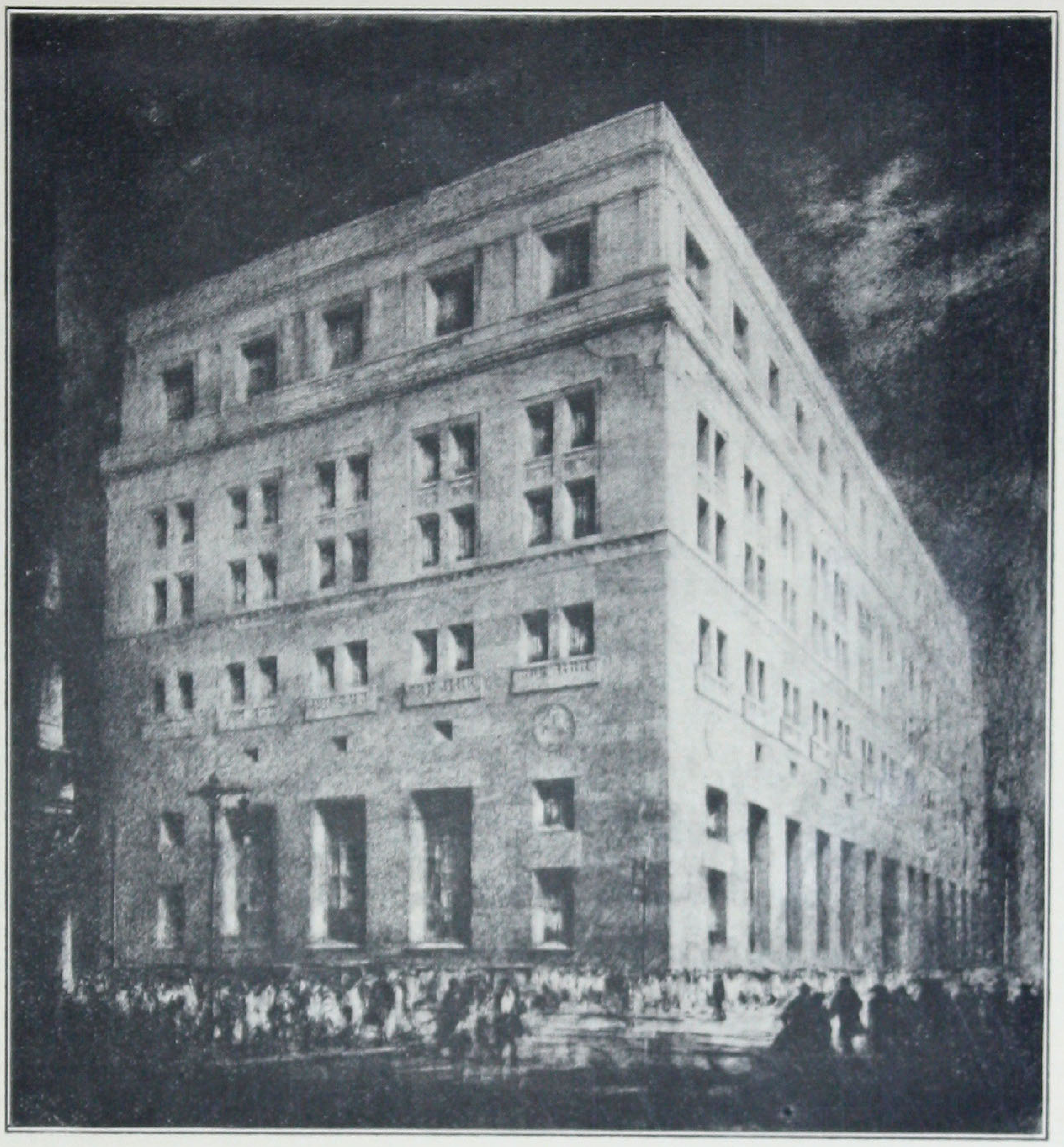
RIVET-GRIP reinforced vaults receive preferential ratings from Insurance Underwriters. The lowest ratings are given to vaults with RIVET-GRIP walls and slabs.

Economy—

RIVET-GRIP SYSTEM Vault Reinforcement costs less than any other adequate and effective system. Conclusive proof of this is offered by the fact that it has been purchased for the vaults of Seven Federal Reserve Banks since the Sandy Hook Federal Reserve tests.

This material is produced on a quantity basis in large modern well equipped shops so that RIVET-GRIP System Vault Reinforcement can be marketed at a figure which is remarkably low, considering the special nature of the material and the amount of fabrication involved.

THE RIVET-GRIP SYSTEM OF REINFORCEMENT



Mauran, Russell & Crowell, Architects.

THE ST. LOUIS FEDERAL RESERVE BANK

Cass Gilbert, Architect, F. S. Holmes, Vault Engineer.

THE MINNEAPOLIS FEDERAL RESERVE BANK

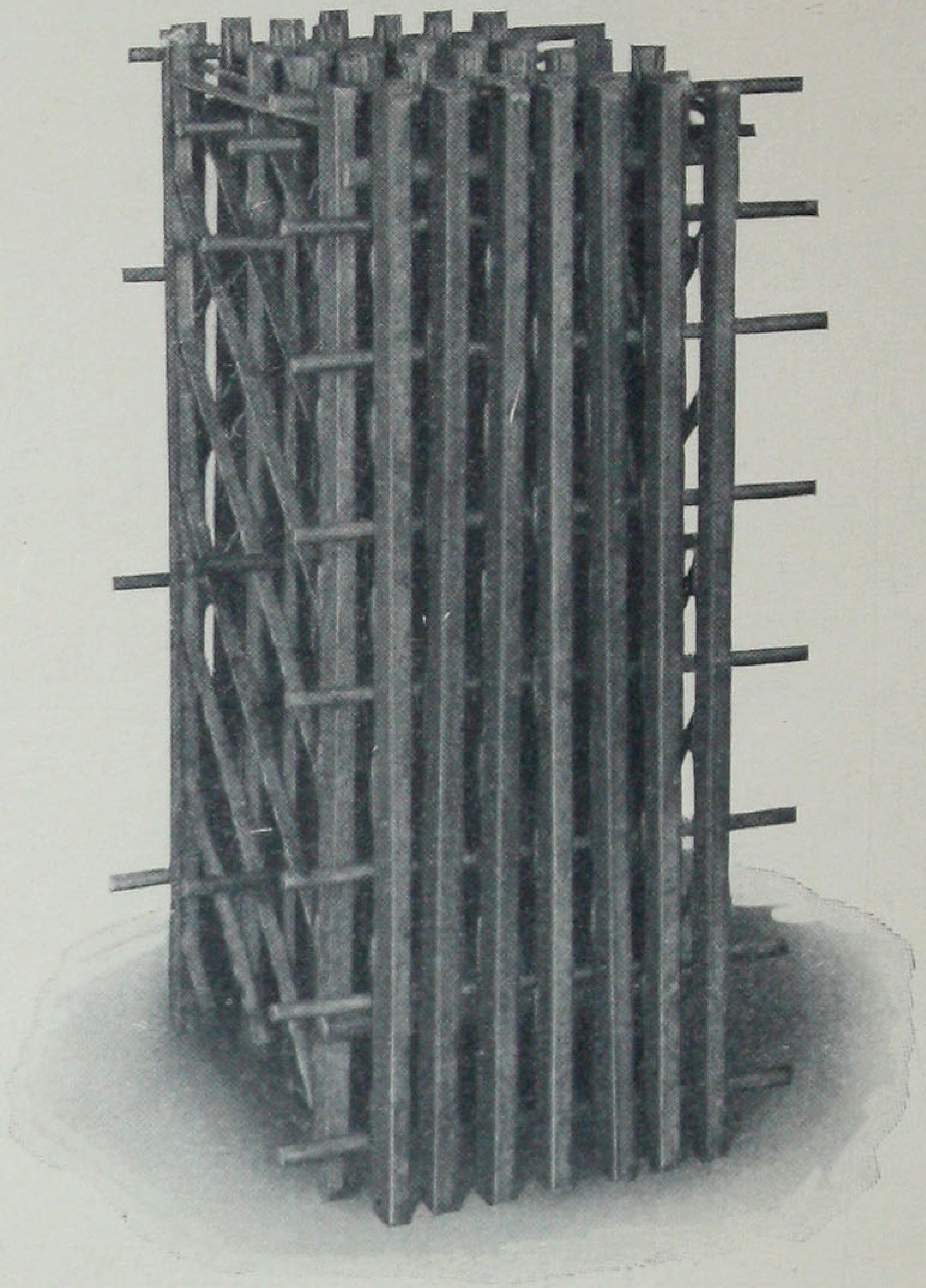
The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

Flexibility of the Rivet-Grip System

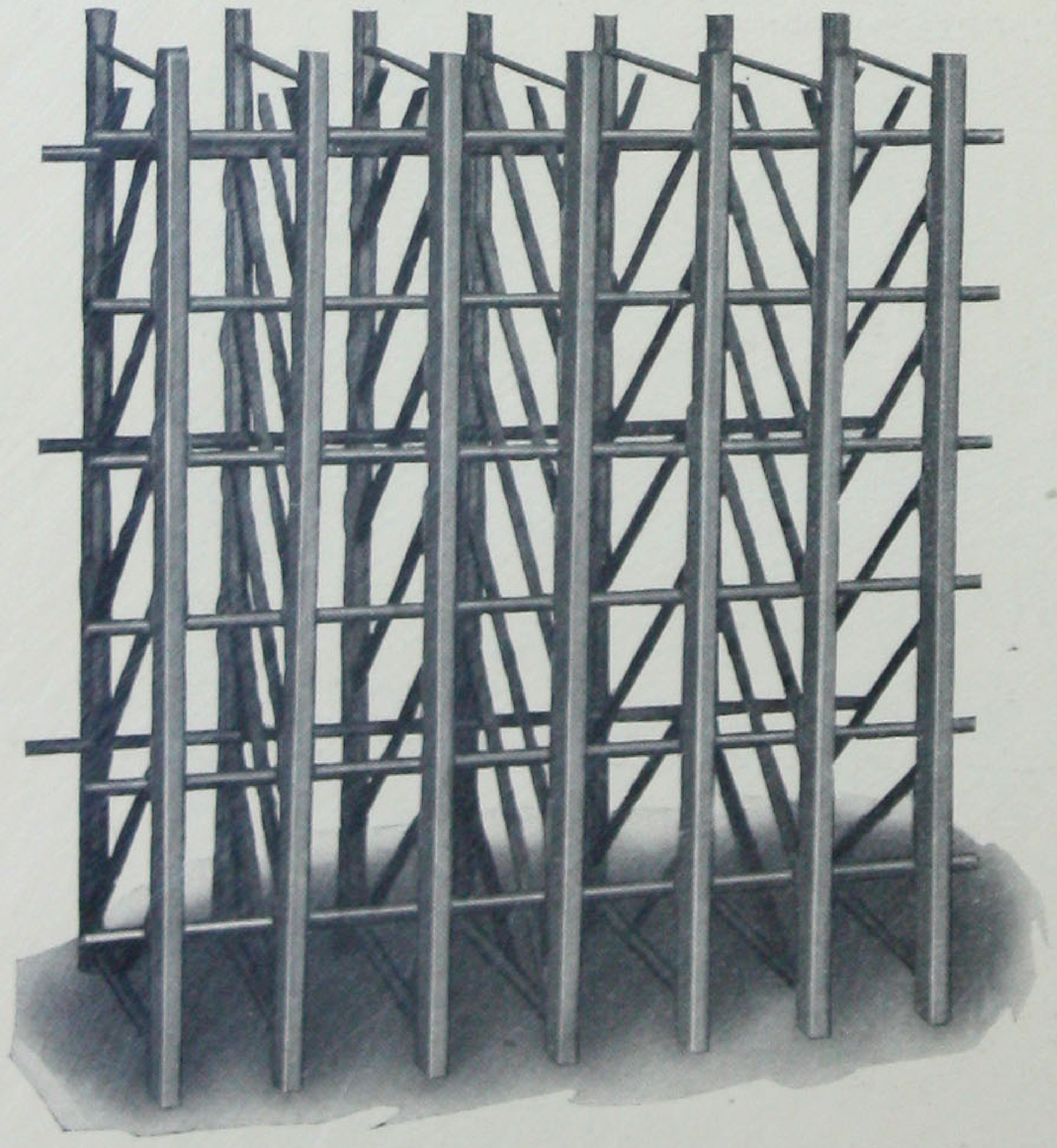
Flexibility in vault design in the past, has been a neglected factor, Very few small vaults were designed, which gave the same relative protection per dollar of expenditure, as the larger and heavier vaults.

The general practice was to standardize the reinforcement in vault walls, floors and roofs, irrespective of the thickness of door purchased. Thus in many instances in the past banks using for example 12″ vault doors, would have no more protection in their vault walls than neighboring banks with only 4″ doors, although the banks using the heavier doors should have built vault walls three times as strong as those built in connection with the lighter doors.

Many vaults have also been built with the mistaken impression that added thickness of plain concrete gave a greater protective value to the vault. This is untrue, as tests have proven that unreinforced concrete or ordinary reinforced concrete in a vault wall offers but little resistance to attack.



The RIVET-GRIP SYSTEM of bank vault reinforcement covers the complete range of requirements. The spacing and general arrangement of the fabricated units may be varied to meet the requirements and degree of protection desired.



Where a great degree of protection is required the units may be placed practically touching each other. As the protection required decreases, the space between units may be increased until a maximum of 6″ on centers is attained. The illustrations clearly show this flexibility of arrangement.

The width of the units may also be increased to practically the full thickness of the concrete; thus conserving space and securing the greatest strength possible in a given thickness of wall.

The flexibility of this system enables the Vault Engineer or Architect to select the most economical and effective type of reinforcement for the vault under consideration.

Due to the inherent characteristics of the RIVET-GRIP units, the distribution of steel in the concrete is uniform, and no matter whether a close or a wide spacing is used, the amount of protection per dollar of expenditure is relatively the same.

This flexibility of arrangement, allows the design of a concrete structure having the same resistive strength as the doors, and facilitates the securing of the ideal condition in vault construction—BALANCED PROTECTION.

THE RIVET-GRIP SYSTEM OF REINFORCEMENT

Thompson & Harding, Architects.

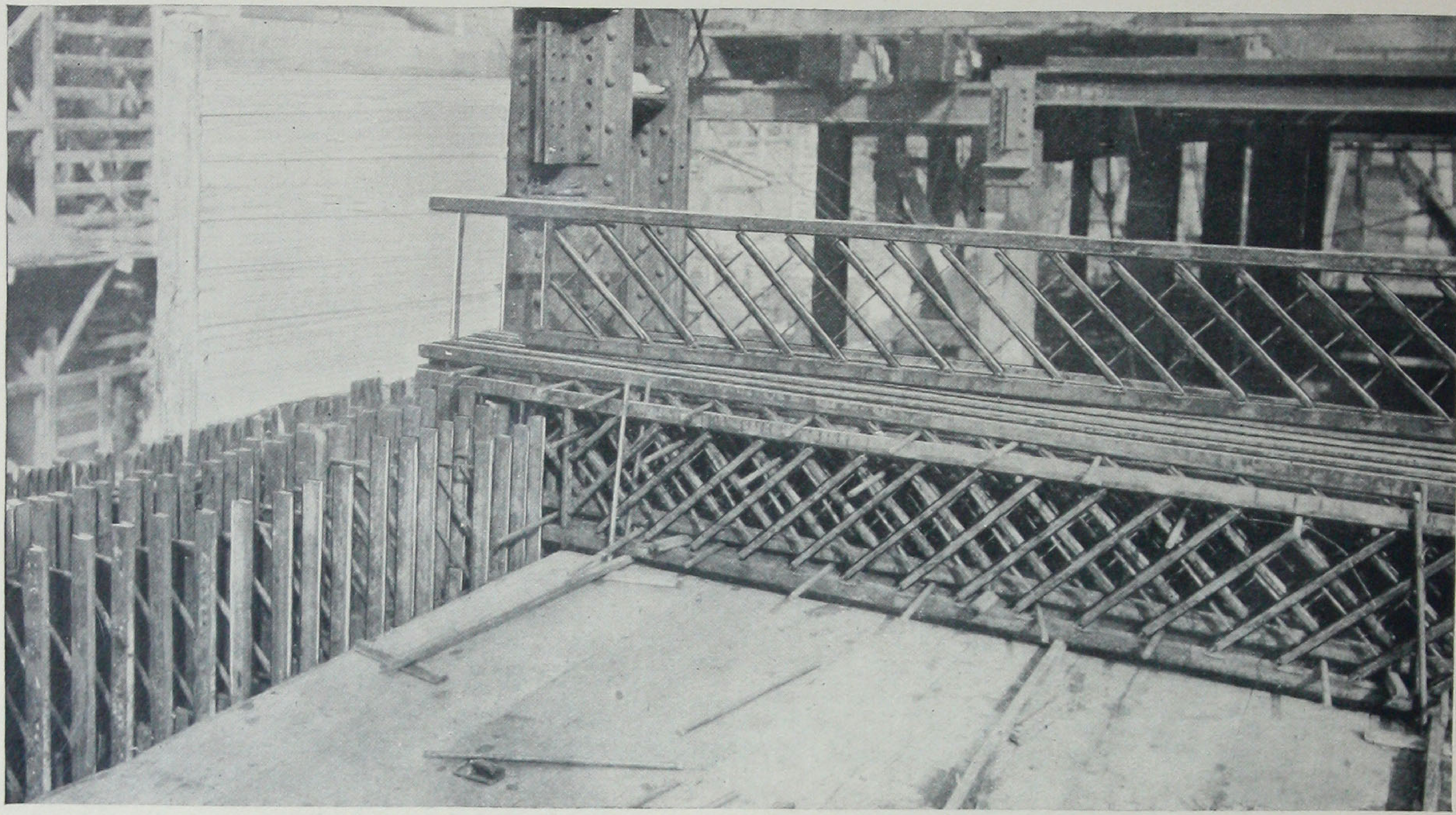
THE LITTLE ROCK BRANCH, FEDERAL RESERVE BANK OF ST. LOUIS

D. X. Murphy & Brother, Architects.

THE LOUISVILLE BRANCH, FEDERAL RESERVE BANK OF ST. LOUIS

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

Special Features of the Rivet-Grip System



TYPICAL INTERSECTION OF WALL AND SLAB IN HEAVY VERTICAL TYPE

In our endeavor to give clients balanced protection, our engineers studied the probable protection that might reasonably be expected of vault doors of different types and thicknesses. A thorough study was then made of the type and amount of RIVET-GRIP reinforcement, and the proper thickness of concrete walls required to balance the protection given by the different thicknesses of vault doors. In all cases the protective values assigned to RIVET-GRIP SYSTEM walls were based on observations from actual tests made by the best means of attack known to modern science. Suggestions and data to be used as a guide in the selection of a proper type of reinforcement are given on other pages of this catalogue.

The connections between doors and walls are usually points of weakness. Our designs make this joint as strong and secure as other portions of the vault. Typical details of door connections are illustrated on another page.

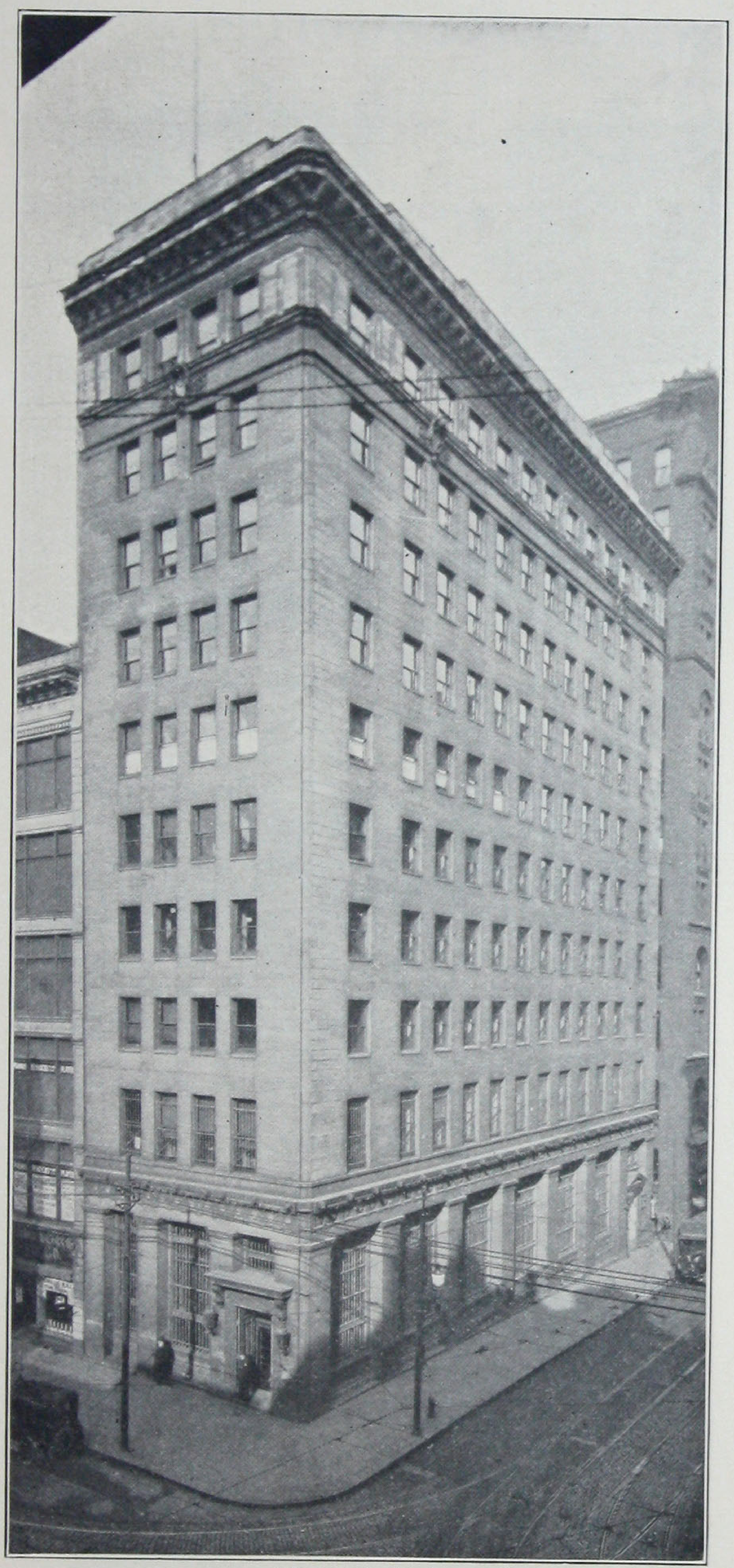
The design of the RIVET-GRIP SYSTEM assures a thoroughly even distribution of all steel as well as the exact location of every unit within the finished structure strictly in accordance with plans and details.

Another important feature of the RIVET-GRIP design is the strength of corner intersections of walls, and of slabs and walls. Ordinarily these points are the most vulnerable in vault construction. In the RIVET-GRIP construction the units are thoroughly dove-tailed and interlocked at all intersections. This makes these points as difficult to penetrate as any portion of the main walls or slabs, and eliminates dislodgment of a whole wall or slab.

The RIVET-GRIP SYSTEM slabs are self-supporting and do not require auxiliary structural members to carry them. In addition to carrying their own weight and usual live loads, the slabs may be designed to carry heavy superimposed loads. RIVET-GRIP vault slabs have been built with heavy superimposed columns and with clear spans up to forty feet. Slabs of even longer spans are possible should the design so require.

All RIVET-GRIP SYSTEM reinforcement is specially detailed for each individual vault. Every piece or unit is completely fabricated in our shop ready to place. No cutting, bending or fitting has to be done at the job. This allows rapid and accurate placing or erection. Ordinary skilled labor can erect this material without difficulty.

THE RIVET-GRIP SYSTEM OF REINFORCEMENT



Walker & Weeks, Architects for interior remodeling and bank equipment

THE PITTSBURGH BRANCH, FEDERAL RESERVE BANK OF CLEVELAND.

Trowbridge & Livingston, Architects.

BANK OF AMERICA, New York City.

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

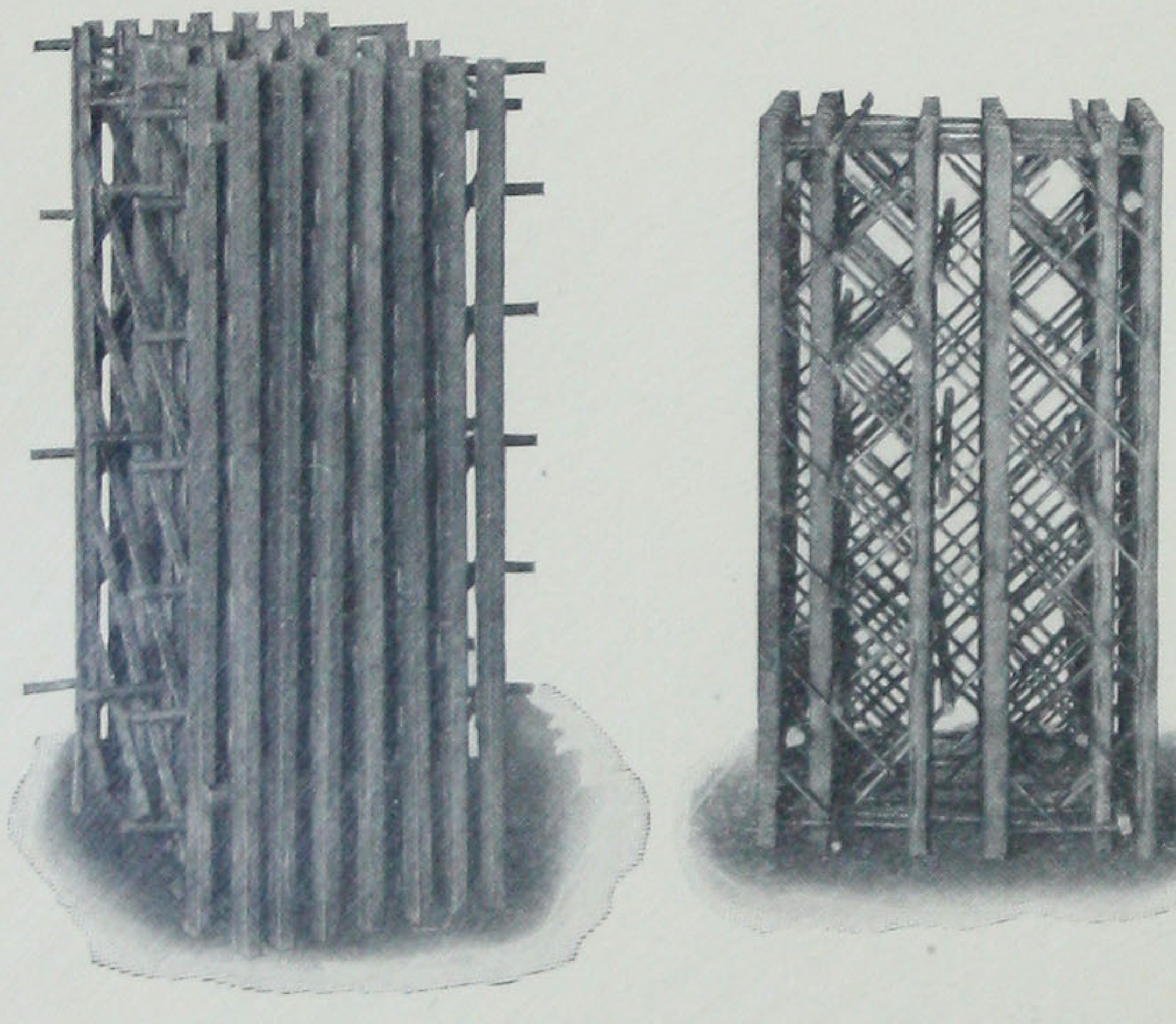
Vertical Type Rivet-Grip System Reinforcement

GENERAL DESCRIPTION

RIVET-GRIP Vertical Type bank vault reinforcement is designed and fabricated for use in walls from 12″ to 30″ in thickness, and in connection with vault doors ranging from 4″ to 24″ in thickness.

The RIVET-GRIP vertical type construction consists of RIVET-GRIP shop-fabricated frames placed vertically on end in walls and horizontally on edge in slabs. The frames may be placed 1¼″, 1½″, 2″, 2½″, 3″, 4″, 5″ or 6″ on centers. The spacings most commonly employed are 2½″, 3″ and 4″ on centers.

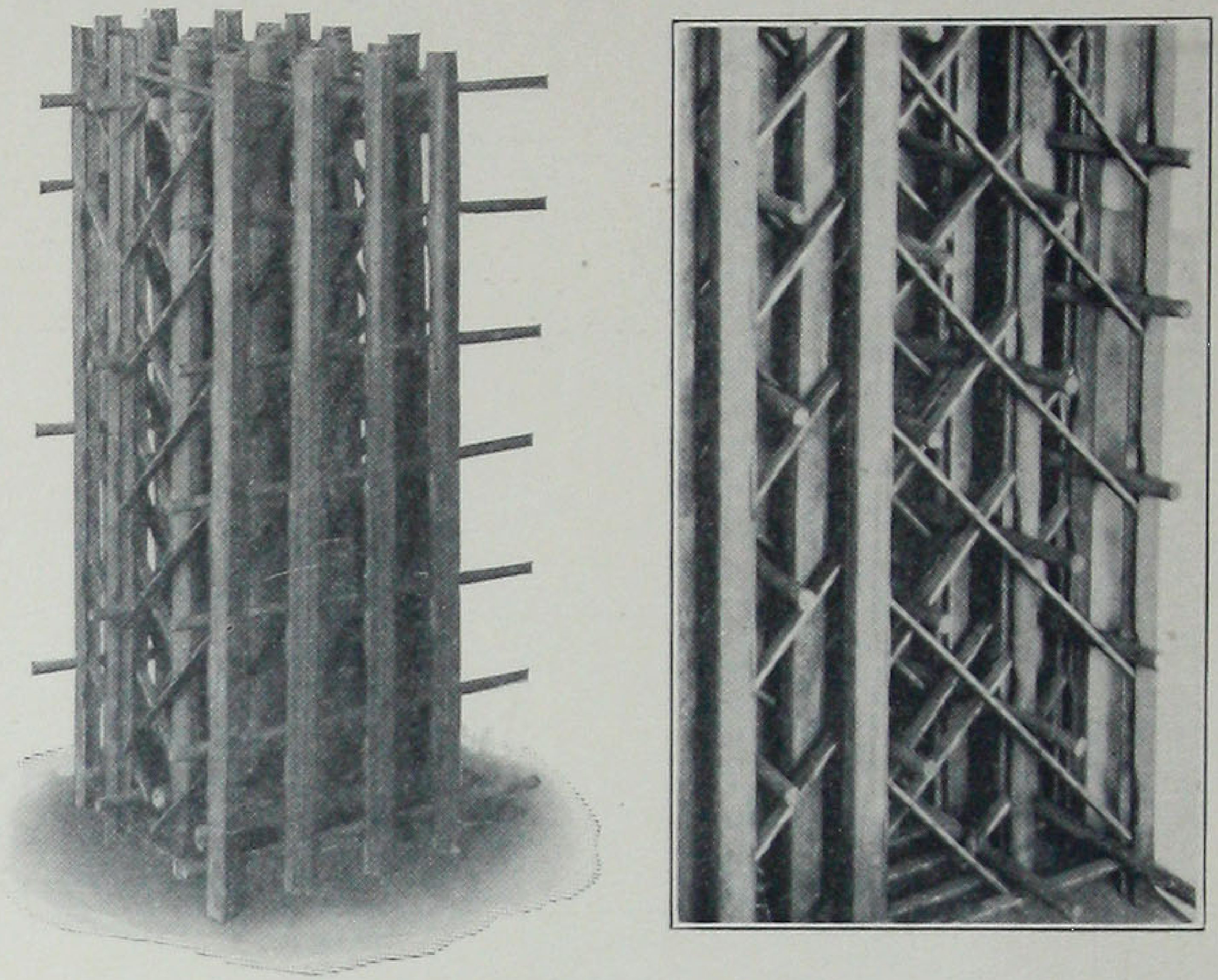
There are three general variations of the vertical form of construction designated as Types "A," "B," and "C." The difference in these forms of construction is clearly indicated in the accompanying illustrations.


Front and Top View View From Side
Frames Spaced 1½″ on centres
VERTICAL TYPE "A" REINFORCEMENT

Type "A" is a very heavy construction and consists of a wide frame alternating with two narrow frames. The narrow frames are staggered with the wide frames and in all cases form the outer rows of reinforcement.

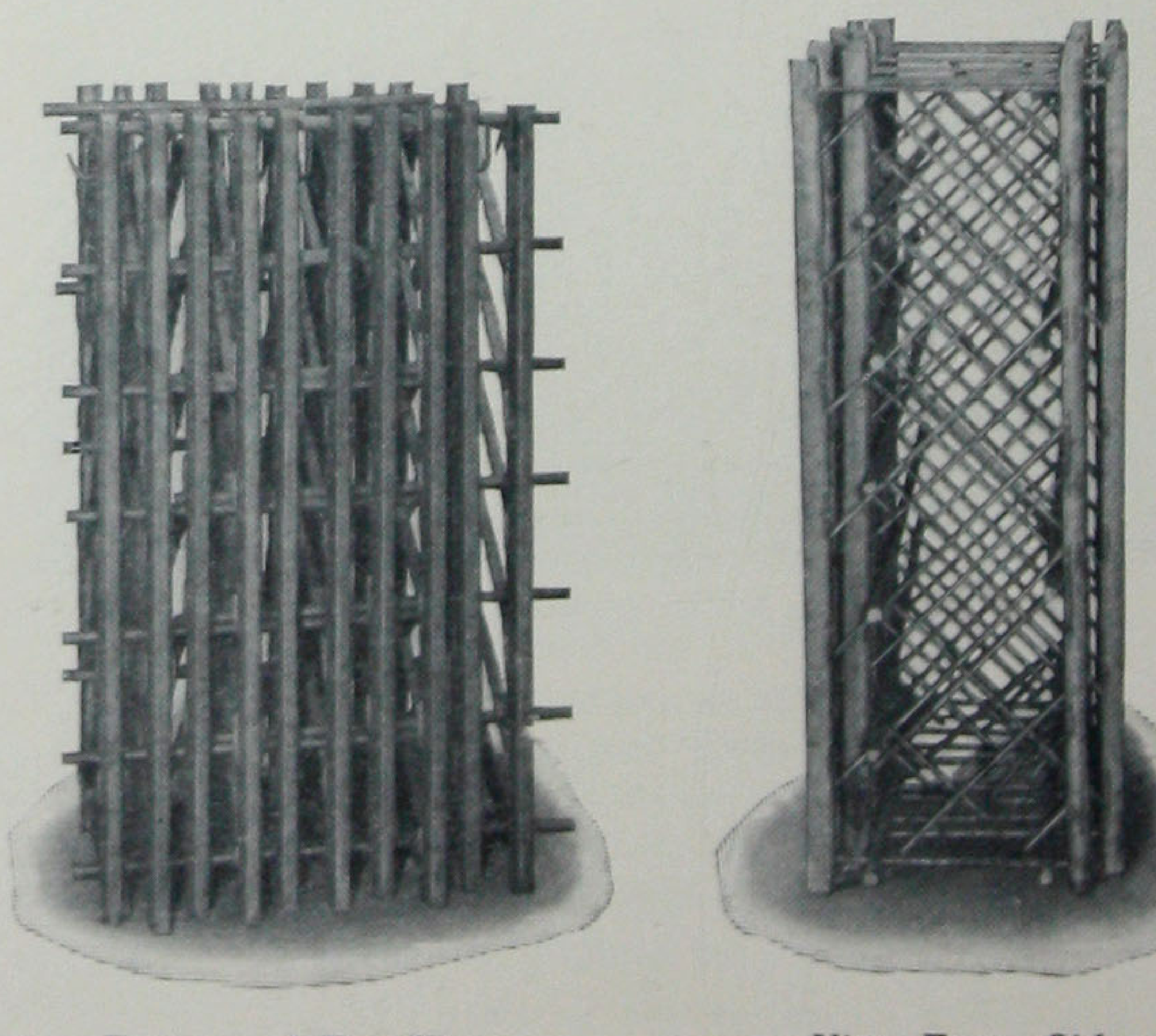
Type "B" is an intermediate construction and consists of frames of uniform width alternating at a deep stagger. It is generally used only in the closer spacings of frames.

Type "C" is generally a lighter construction and consists of frames of uniform width usually placed in line, except that in the 3″ spacing the frames alternate at a shallow stagger. It should only be used with spacings of 3″ or more.


Front and Top View View From Side
Frames Spaced 2½″ on centres
VERTICAL TYPE "B" REINFORCEMENT

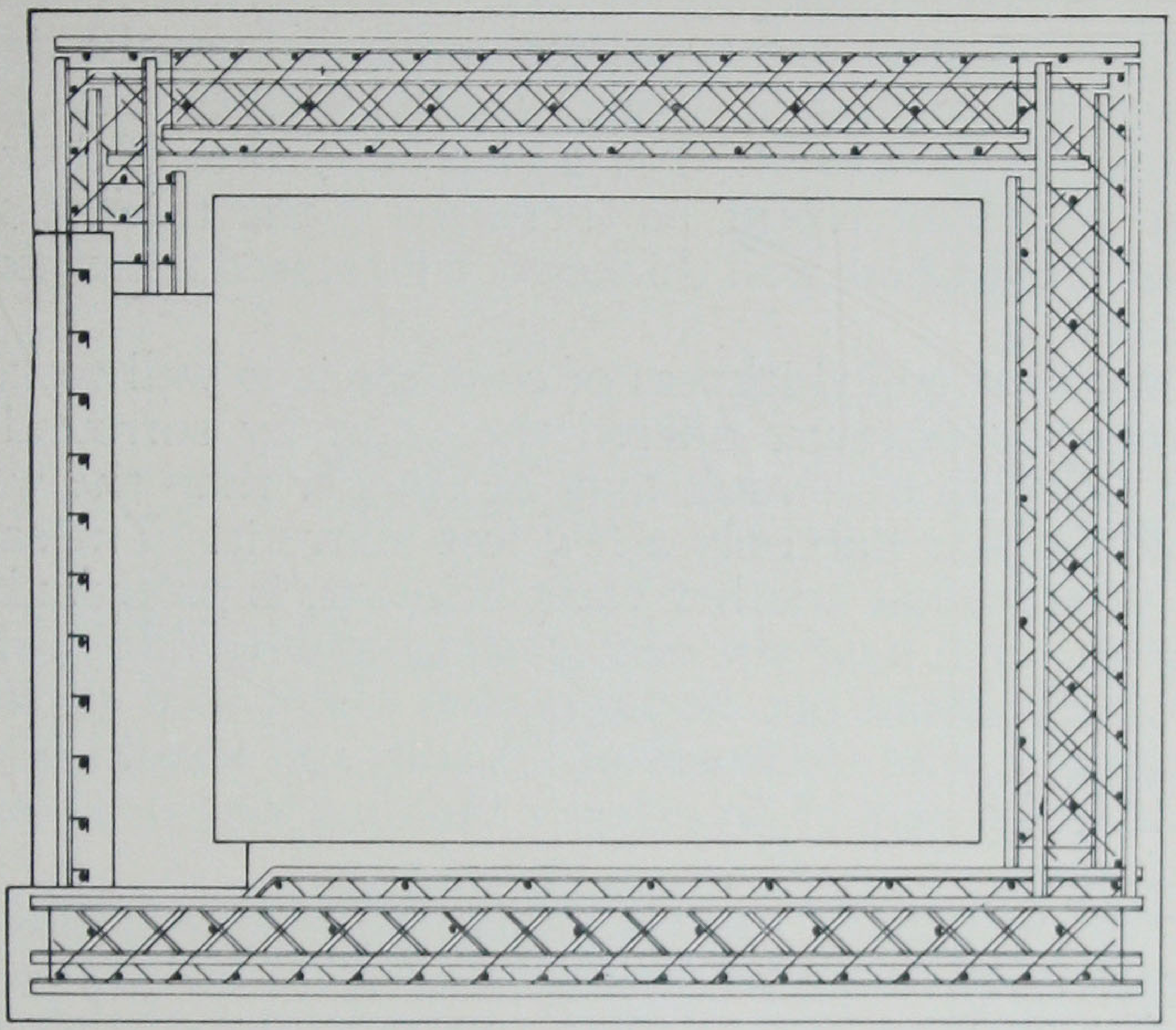
In all cases plain round bars are laced horizontally through the web members or diagonals of the RIVET-GRIP frames as shown in the illustrations. These bars are usually spaced 6″ on centers near the outside faces of walls and slabs, and 12″ on centers at the center or the inside faces. Note that the bars always rest on stirrups and do not need to be wired in position.

The typical sections shown on the next page illustrate the details of the interlocking of members at wall and slab intersections.

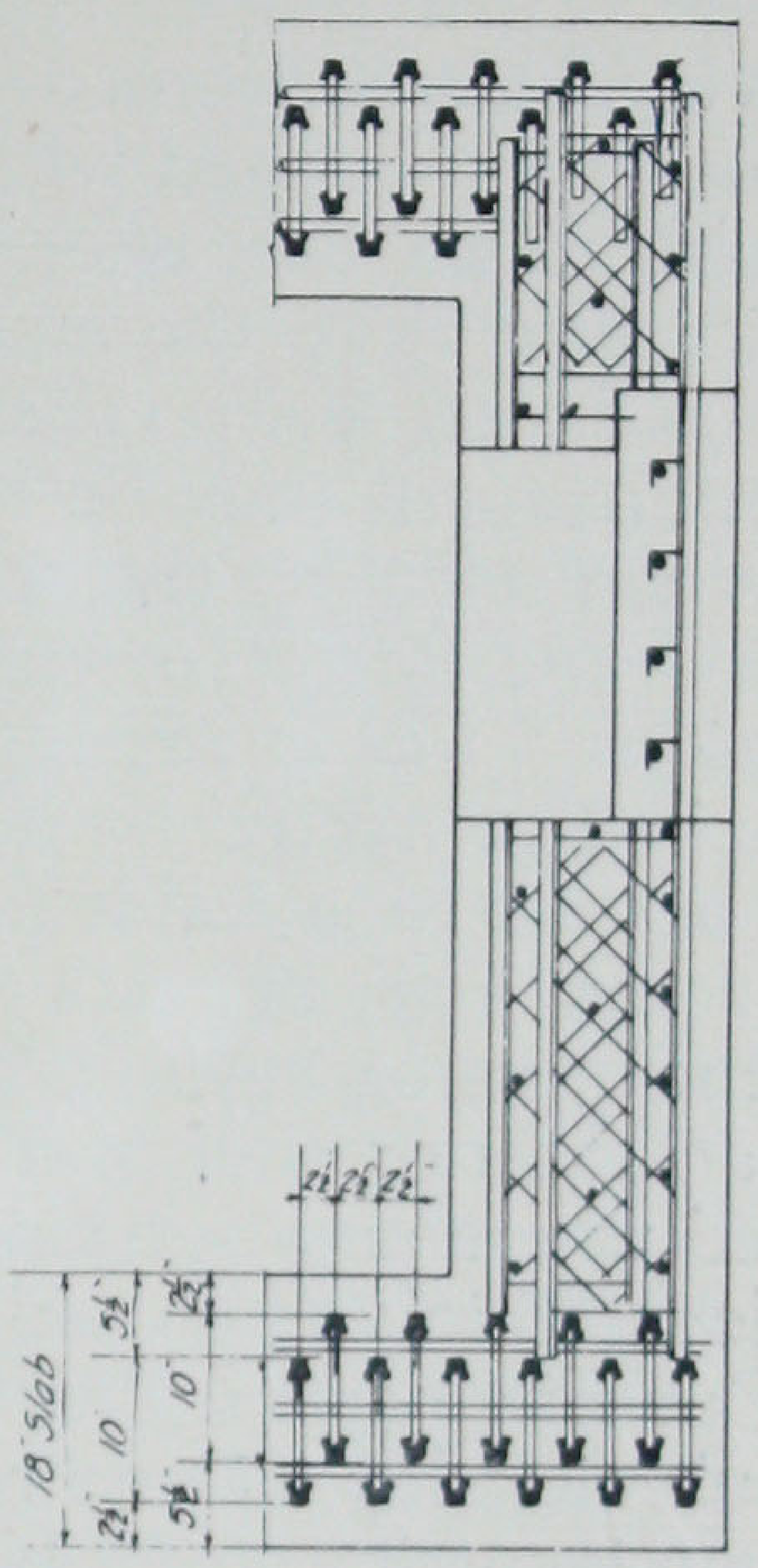

Front and Top View View From Side
Frames Spaced 3″ on centres
VERTICAL TYPE "C" REINFORCEMENT

Typical Layout for Vault Reinforced with the

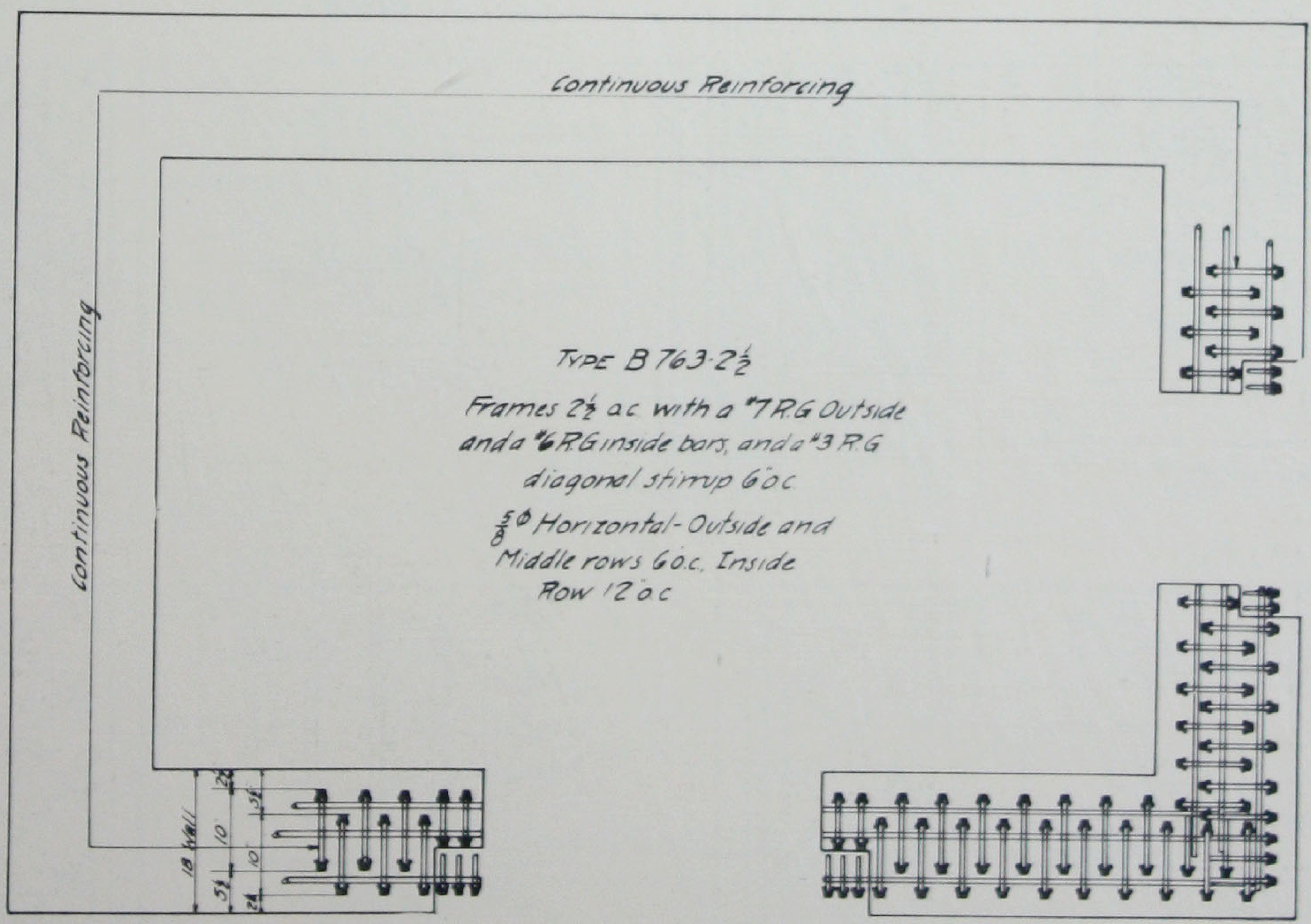
Rivet-Grip System Vertical Type



TRANSVERSE SECTION



SECTION THRU EMERGENCY DOOR


Continuous Reinforcing
Continuous Reinforcing
TYPE B 763-2½
Frames 2½ o.c. with a #7 R.G Outside
and a #6 R.G inside bars, and a #3 R.G
diagonal stirrup 6" o.c.
5/8 ø Horizontal - Outside and
Middle rows 6" o.c. Inside
Row 12" o.c.
18 Wall
2½
5½
10
10
5½
2½

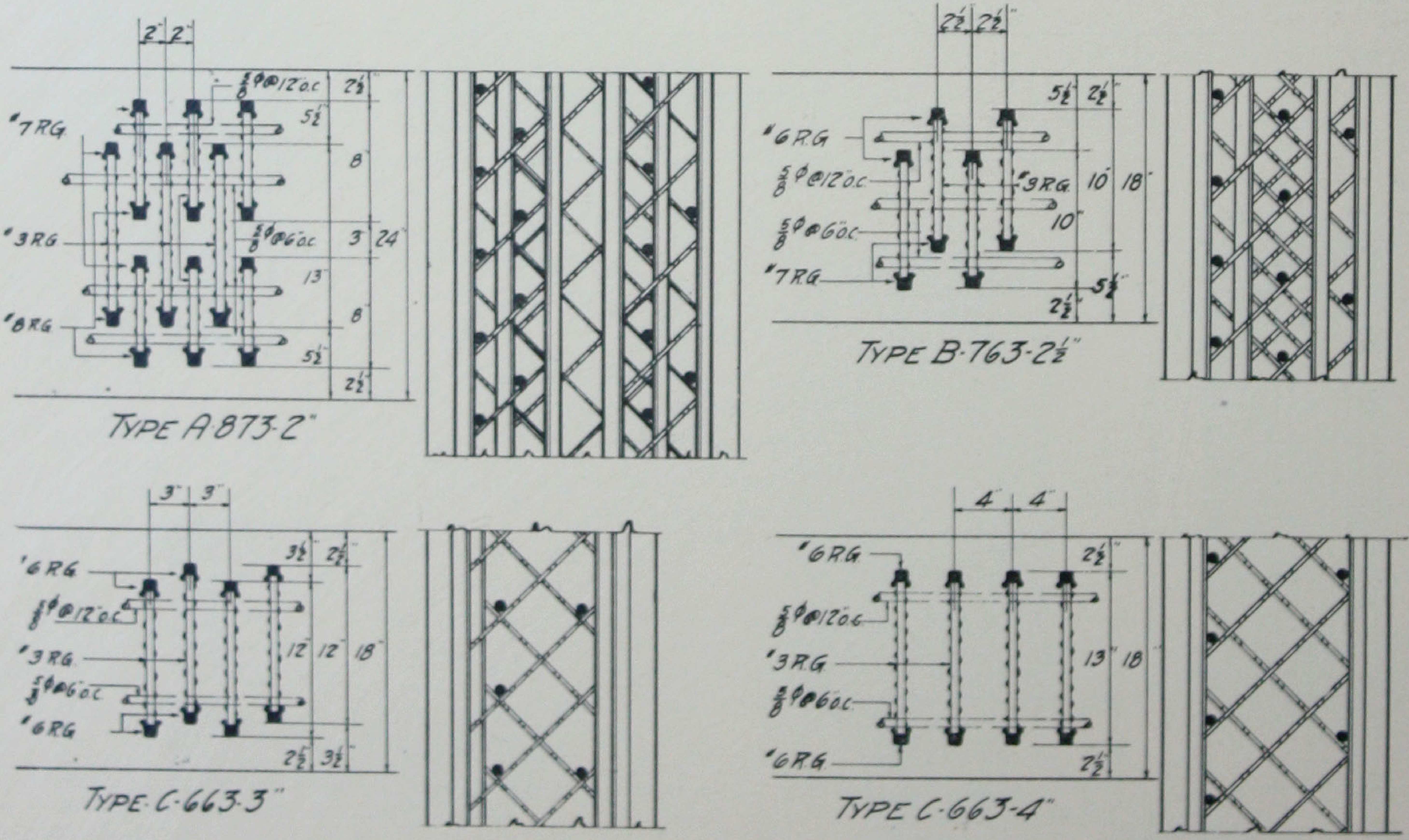
PLAN

Selection of Proper Types of Rivet-Grip System of Reinforcement

The recommendations given on the next page are intended as a guide to the selection of the proper types of RIVET-GRIP SYSTEM reinforcement required for giving balanced protection. In general, the types recommended are the lightest that should be used with given thicknesses of doors. In many cases it may be advisable to use a heavier type of reinforcement. For a given thickness of door, it is axiomatic that the amount of reinforcement be increased if the thickness of wall is reduced, and on the other hand where wall thickness is increased the amount of reinforcement may be reduced.

When selecting the reinforcement and thickness of concrete it is well to keep in mind the degree of protection or exposure offered the vault by surrounding conditions. For example, the roof slab of a vault may be thinner than the walls where it is protected by a building floor slab only a few feet above it. The same thing applies to a vault floor where it has another vault below it, is protected by column footings, or rests on solid earth near the center of a building. However, the thickness of a vault floor slab should not be decreased where it is situated near an exterior wall of a building. The thickness of a vault wall should be increased where any portion of it forms part of an exterior building wall or is other wise located in an exposed position.

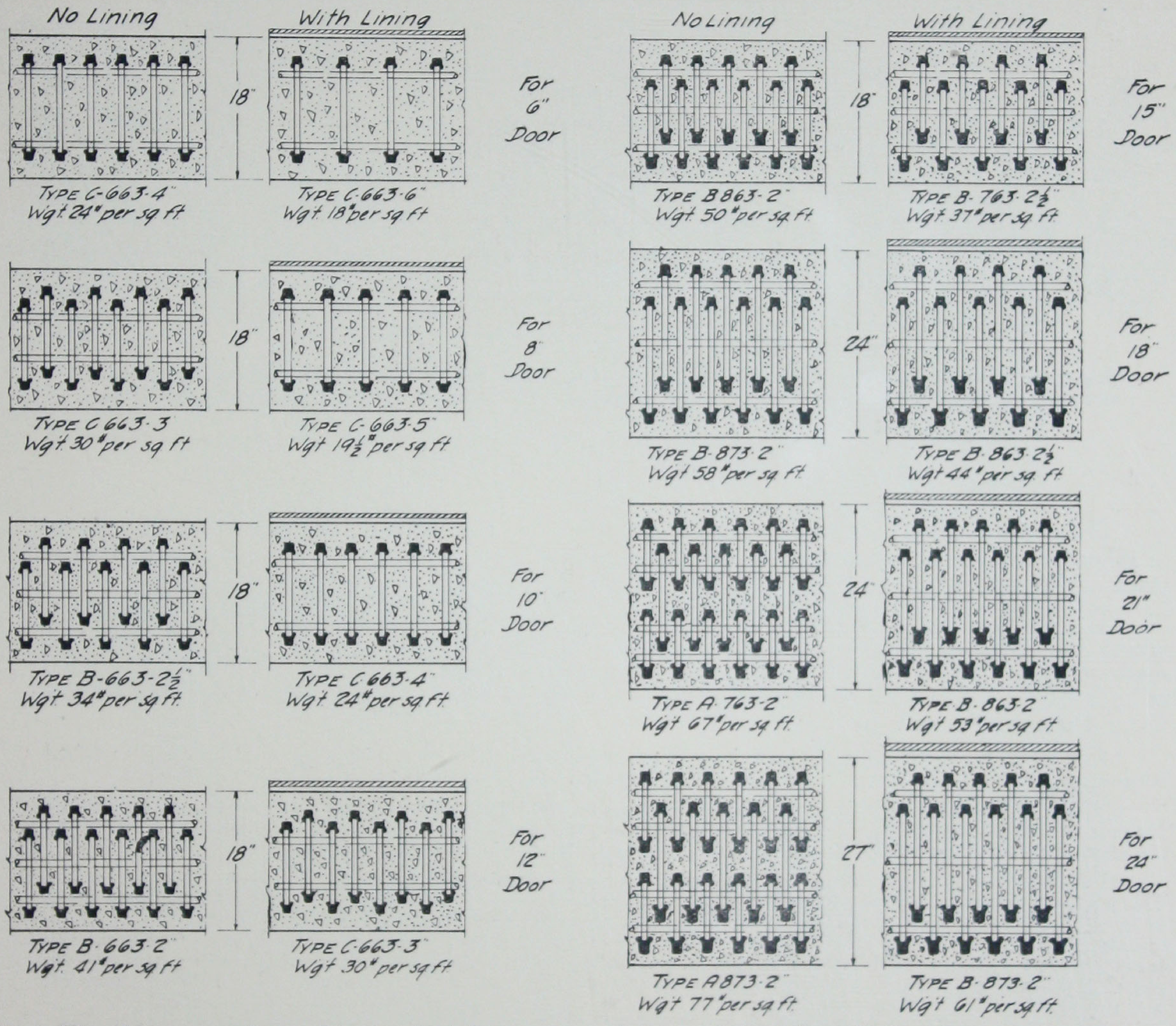
Our Engineering Department will gladly make a study of any vault problem, and submit a layout and recommended design for your consideration and approval, without incurring any obligation on your part, if plans or dimensioned sketches of the vault are submitted to us. Whenever available, thicknesses of doors and linings should also be given.



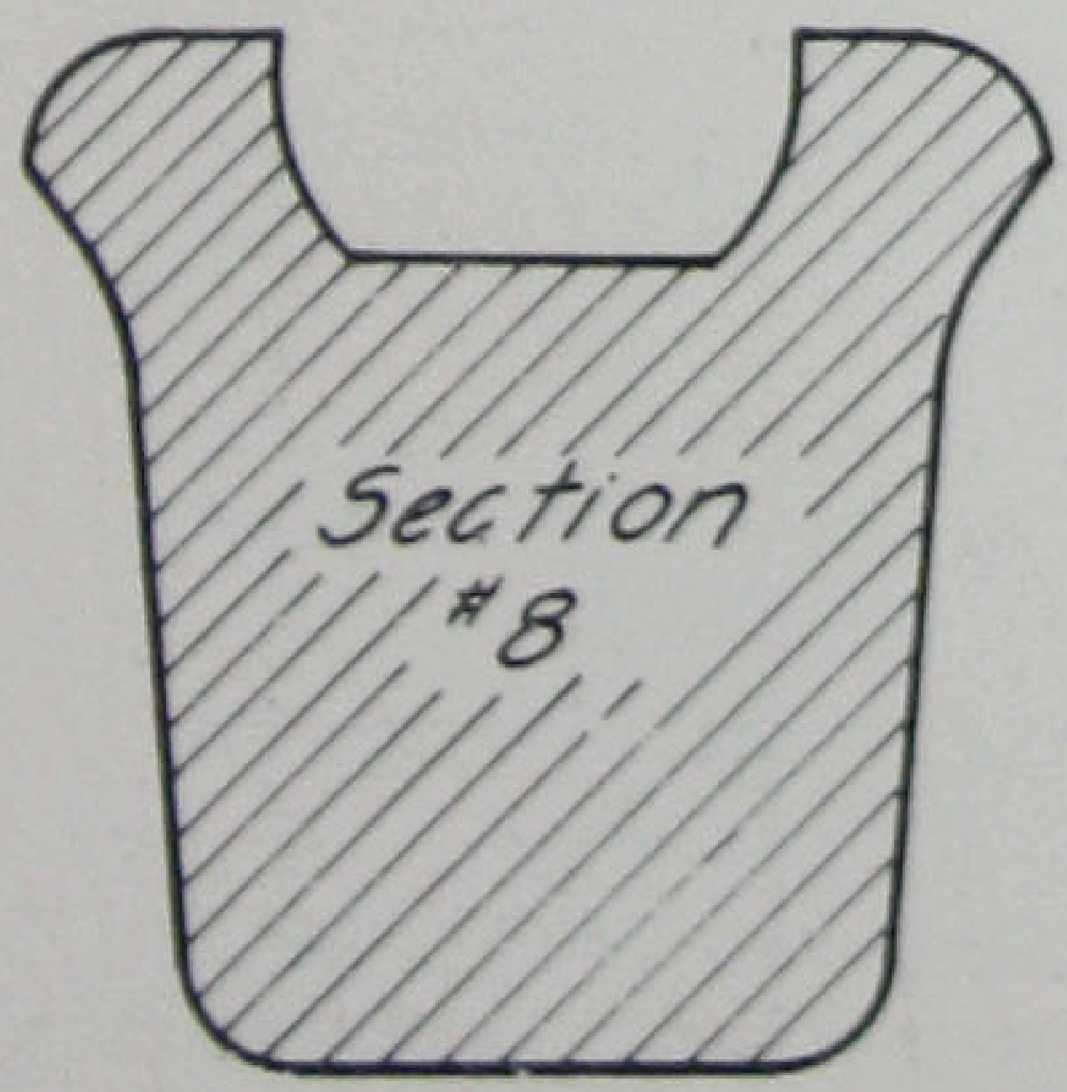
STANDARD DETAILS OF "A", "B" AND "C" TYPES OF RIVET-GRIP VAULT REINFORCEMENT FOR WALLS AND SLABS.

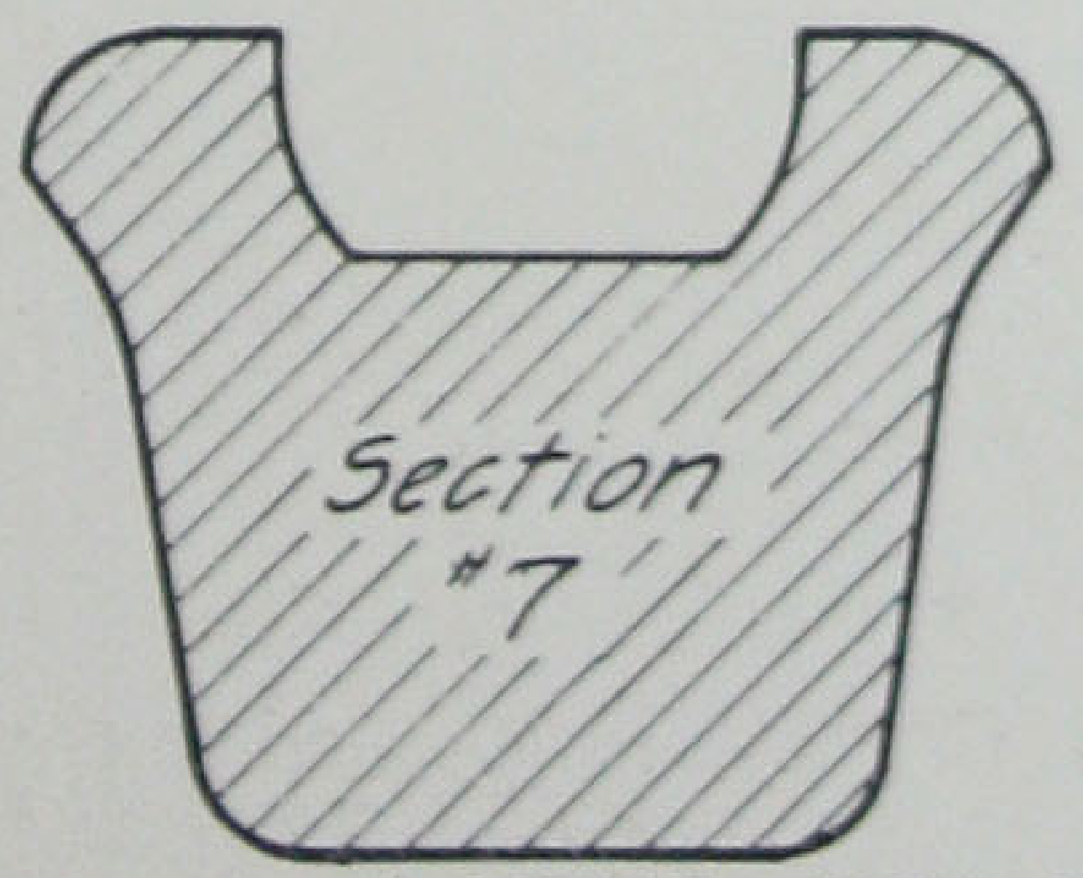
Suggested Types of Rivet-Grip System Reinforcement to Balance Various Thicknesses of Vault Doors

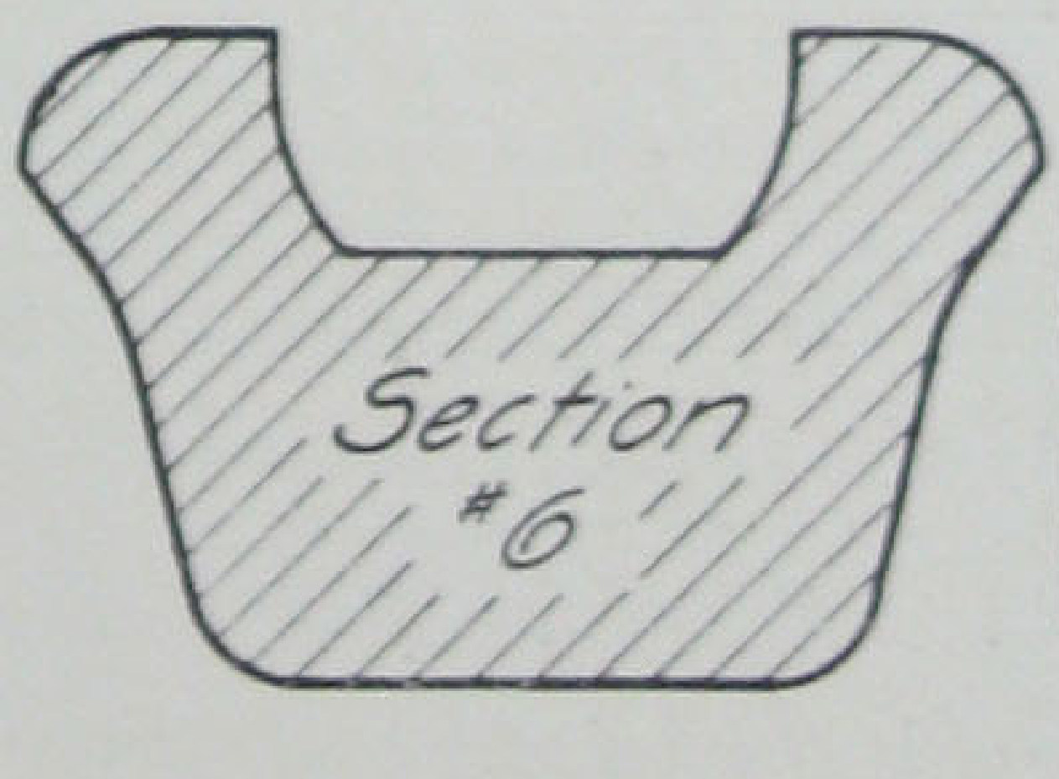
These types of reinforcement in conjunction with concrete thicknesses as indicated below will take the same insurance rating as the doors opposite which they are listed. The weights per square foot, as given, are for the full thickness of walls or slabs.

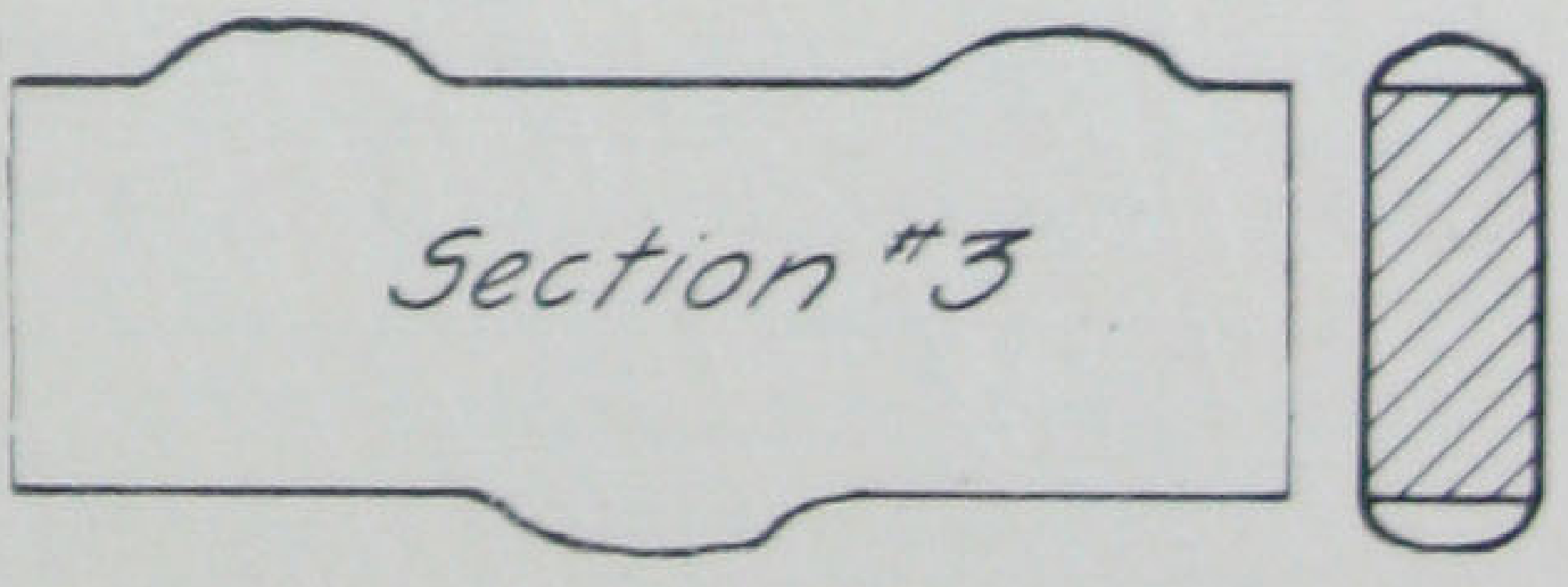


The above suggestions of types of reinforcement to balance various door thicknesses are intended only as a guide in selecting proper reinforcement. We prefer to make a study of each individual problem and then to present a solution and design to suit the particular case involved.





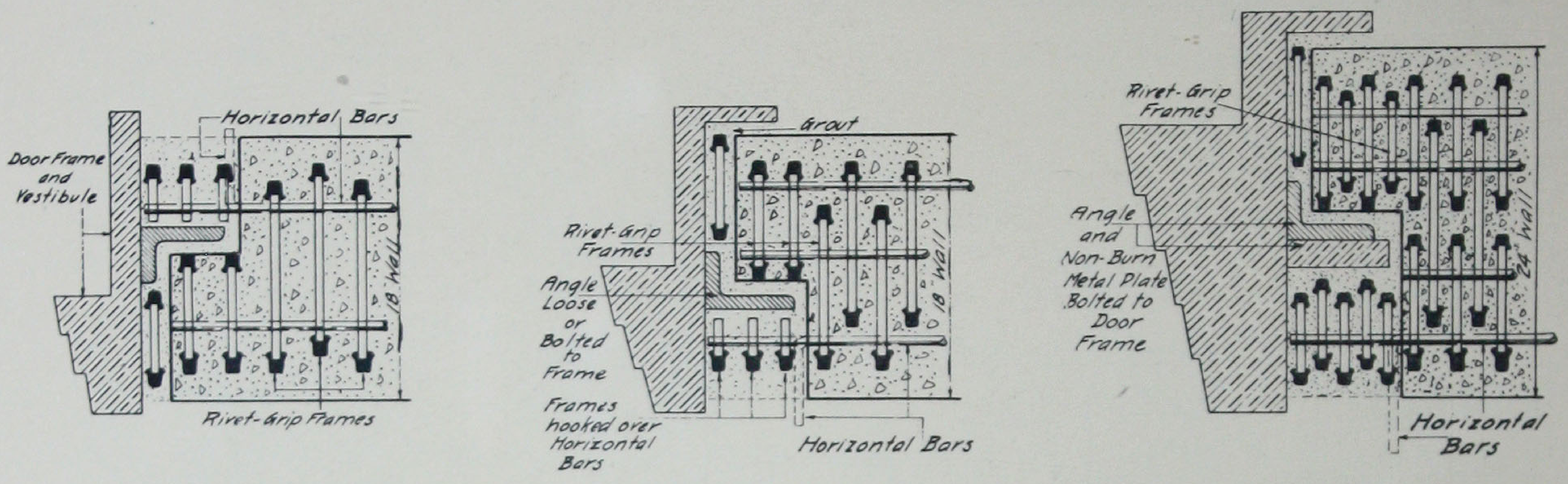




FULL SIZE REPRODUCTIONS OF RIVET-GRIP SECTIONS

These illustrations show the sizes of RIVET-GRIP sections commonly used in vault construction. The section numbers are used in all type designations of RIVET-GRIP SYSTEM reinforcement. For example, Type C-763 indicates that the "C" arrangement of frames is used and that the frames are made up of Sections #7 on the outside and Sections #6 on the inside connected by diagonal Sections #3.

Details of Door Connections



HORIZONTAL BARS IN OFFSETS IN CONCRETE OPENINGS ARE BENT TO DOTTED POSITIONS BEFORE SETTING DOORS AND AFTERWARDS THEY ARE BENT BACK TO ORIGINAL POSITIONS BEFORE GROUTING

The connections between doors and vestibules and the walls of vaults are usually points of inherent weakness, unless special provisions are made to increase the strength of the connections. Heretofore, it has been very difficult and expensive to secure good strong joints.

The use of the RIVET-GRIP SYSTEM of reinforcement, however, offers a method by which this difficult feature of construction can be worked out in a simple and workmanlike manner. With this system a good strong connection can easily be made, due to the flexibility of construction, which allows closer spacing of frames or the use of specially fabricated frames around the door openings.

In the above illustrations are shown three methods recommended for connecting doors to walls. Each method adequately provides a joint equal in strength to the doors and walls it connects.

Usually, construction problems and other considerations require that the concrete walls be poured long before the doors are ready for placing. In such cases, a simple method has been devised for securing the doors and making the connection between the doors and walls as strong as other portions of the vault.

In this method, shown by center illustration, the masonry opening has an offset to accomodate a steel angle. This angle is placed against the sides and top of the door, and is backed by a solid portion of the main wall and faced in front by special sections of reinforcement. The angle, protected on both sides by RIVET-GRIP SYSTEM reinforcement, makes an effective barrier against penetration of the joint by any form of attack. The offset ordinarily is not required under the door as the door frame usually has a metal-to-metal contact with the thick steel leveling plate. The leveling plate in turn is practically in contact with the wall reinforcing so that the bottoms of doors are well protected.

Sometimes it is advisable to place the offset in the masonry opening on the inside of the vault. This method is a reversal of the one just outlined and is shown by the illustration on the left.

The steel angle, whether loose or bolted to the door frame, is located so that it fits into the offset. Before placing the door and angles, the projecting horizontal bars are bent outward so as to permit the angle to enter. After the angle is in place, the bars are bent back so that their ends touch the door frame. The front of the angle is then protected by RIVET-GRIP sections which have stirrup hooks on the back. The stirrups hook around the horizontal bars. The space between the door frame and the opening is then filled with a rich cement grout.

For very heavy doors and walls the connection recommended is shown on the right. The method is similar to that used for lighter doors except that a piece of non-burn plate is bolted in front of the angle, and the protection in front of the angle and plate consists of RIVET-GRIP frames engaged with a row of horizontal bars.

Where horizontal type reinforcement is used similar angles and plates are attached to the door frames and special horizontal frames are detailed for the door openings.

In addition to the above methods, which show how well RIVET-GRIP SYSTEM reinforcement is adapted to form a good joint or connection, other means sometimes have to be devised to meet the needs of some particular problem. In a case of this kind we will gladly submit designs or suggestions for the best solution.

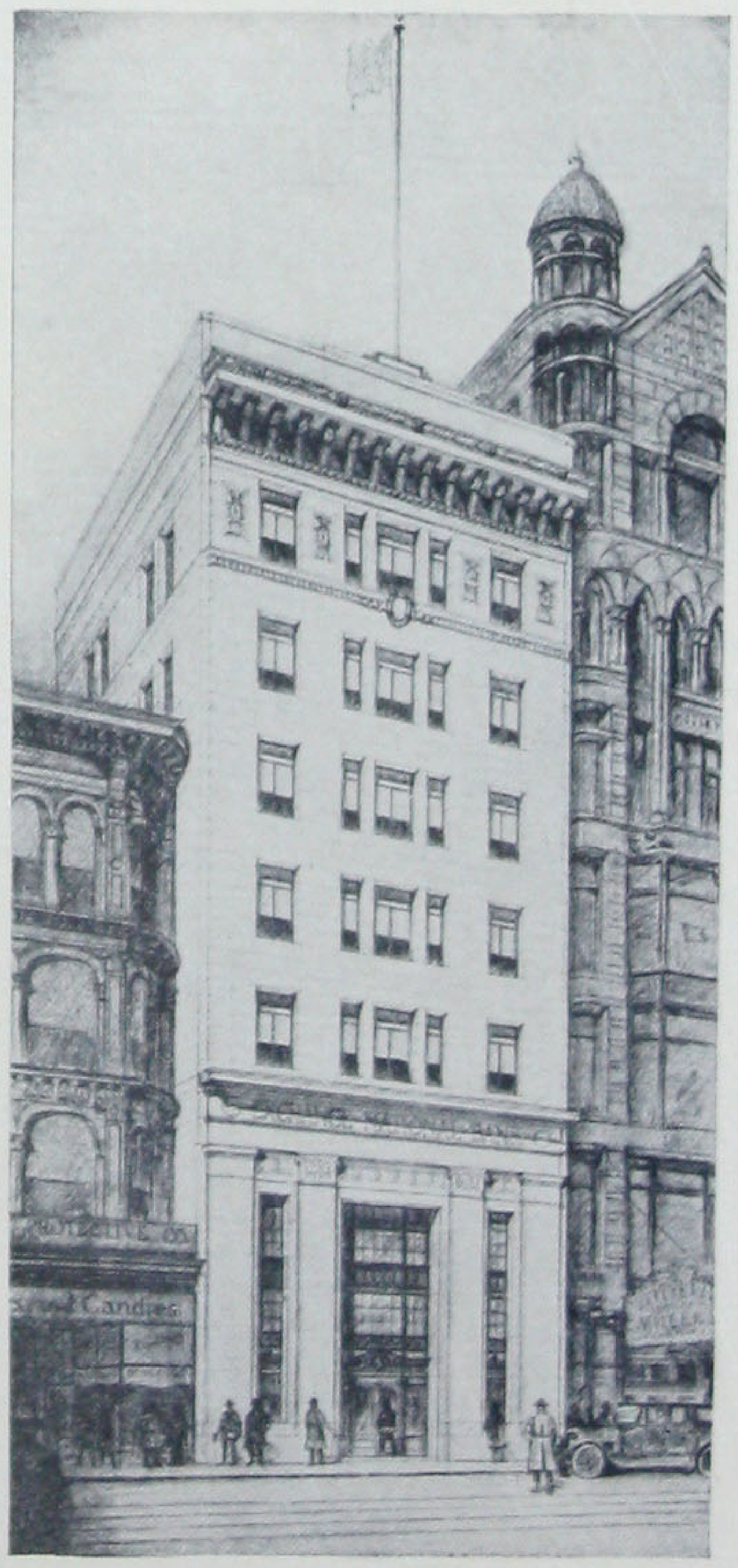
THE RIVET-GRIP SYSTEM OF REINFORCEMENT

Trowbridge & Livingston, Architects.

THE MELLON NATIONAL BANK OF PITTSBURGH

Walker & Weeks, Architects

THE CLEVELAND DISCOUNT COMPANY

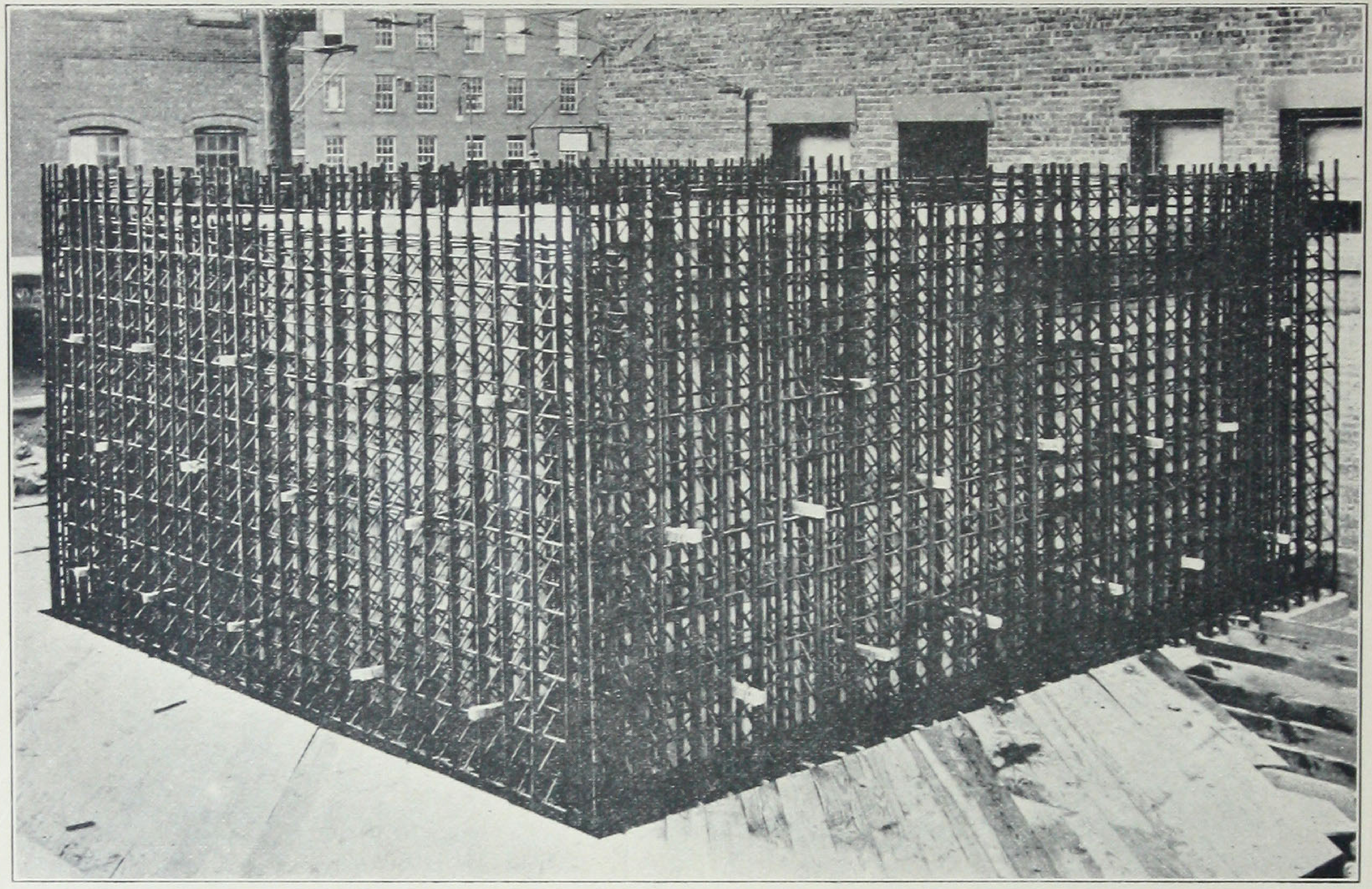


Weary & Alford Co., Architects.

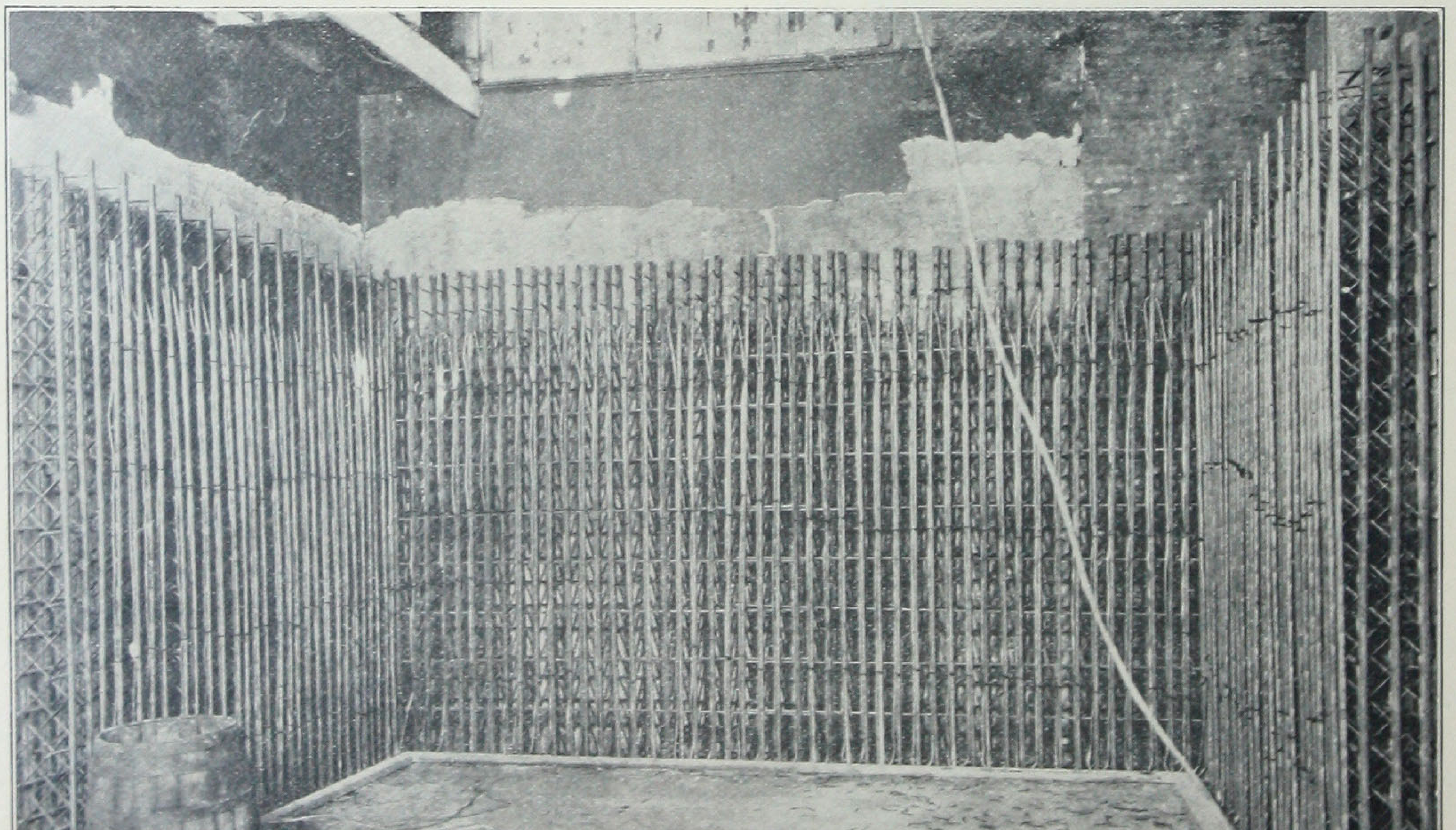
THE EXCHANGE NATIONAL BANK
PITTSBURGH, PA.,
Entire building for the exclusive use of the bank.

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

Typical Rivet-Grip Installations

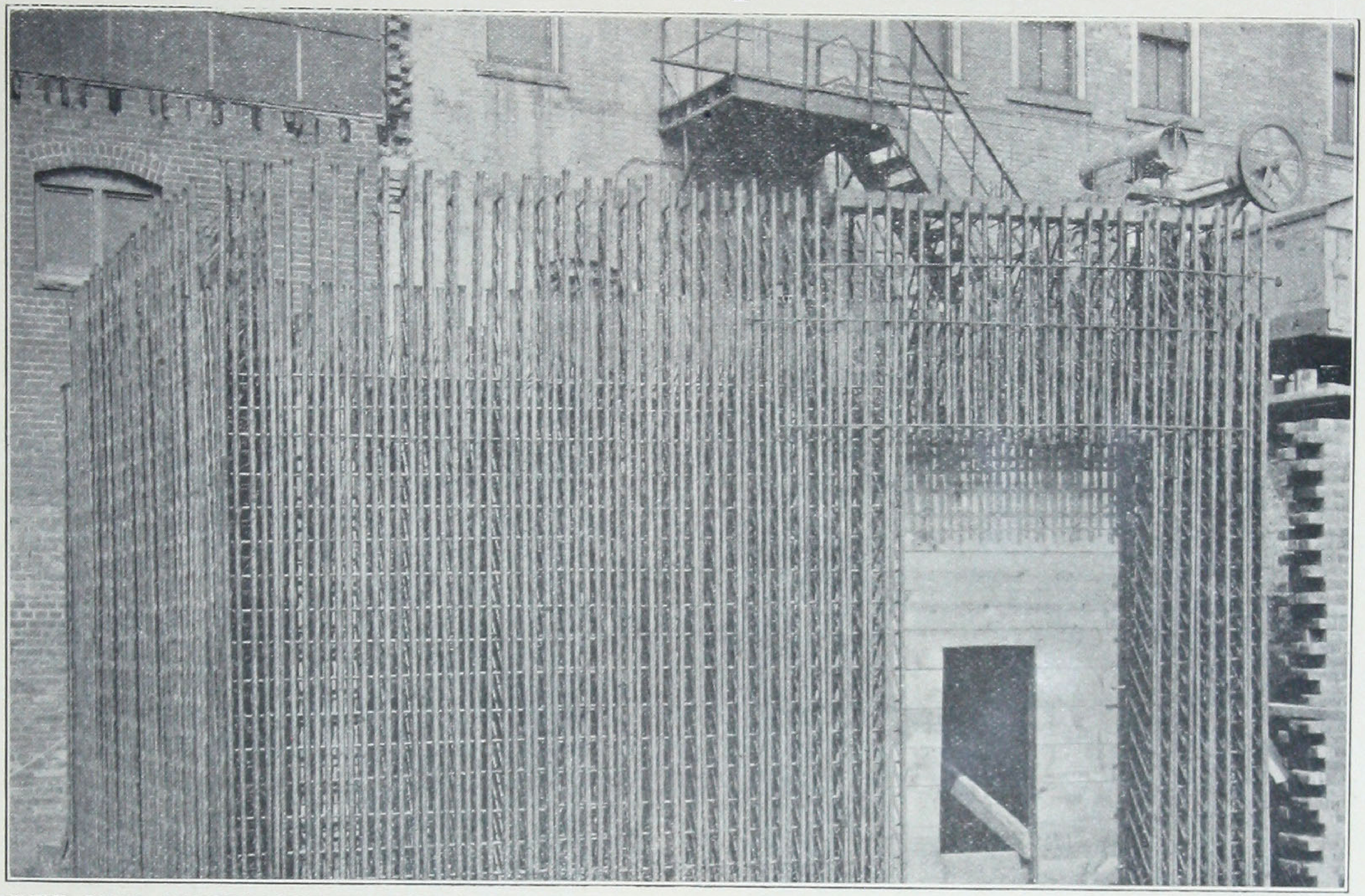


RIVET-GRIP SYSTEM REINFORCEMENT VERTICAL **TYPE C-663-6″** SPACING OF FRAMES ERECTED COMPLETE IN WALLS OF VAULT READY FOR OUTSIDE FORMS AND CONCRETE.

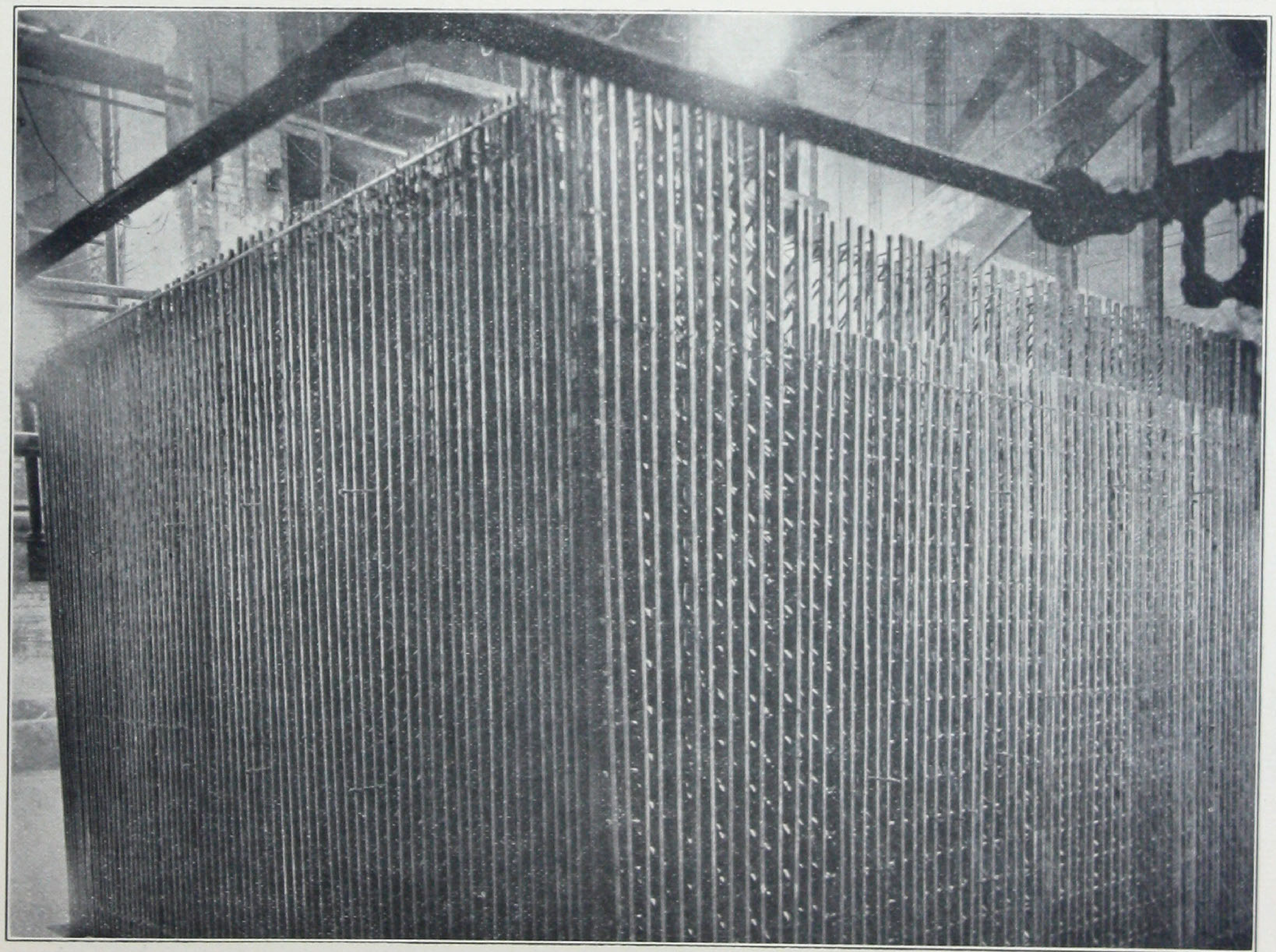


RIVET-GRIP SYSTEM REINFORCEMENT VERTICAL **TYPE C-663-3″** SPACING OF FRAMES PARTIALLY ERECTED IN WALLS OF VAULT. IN THIS VAULT THE INSIDE FORM WORK WAS ERECTED LAST. THIS IS A REVERSAL OF THE CUSTOMARY PRACTICE. NOTE THE ELECTRIC PROTECTION CABLES INTERLACED BETWEEN THE RIVET-GRIP FRAMES.

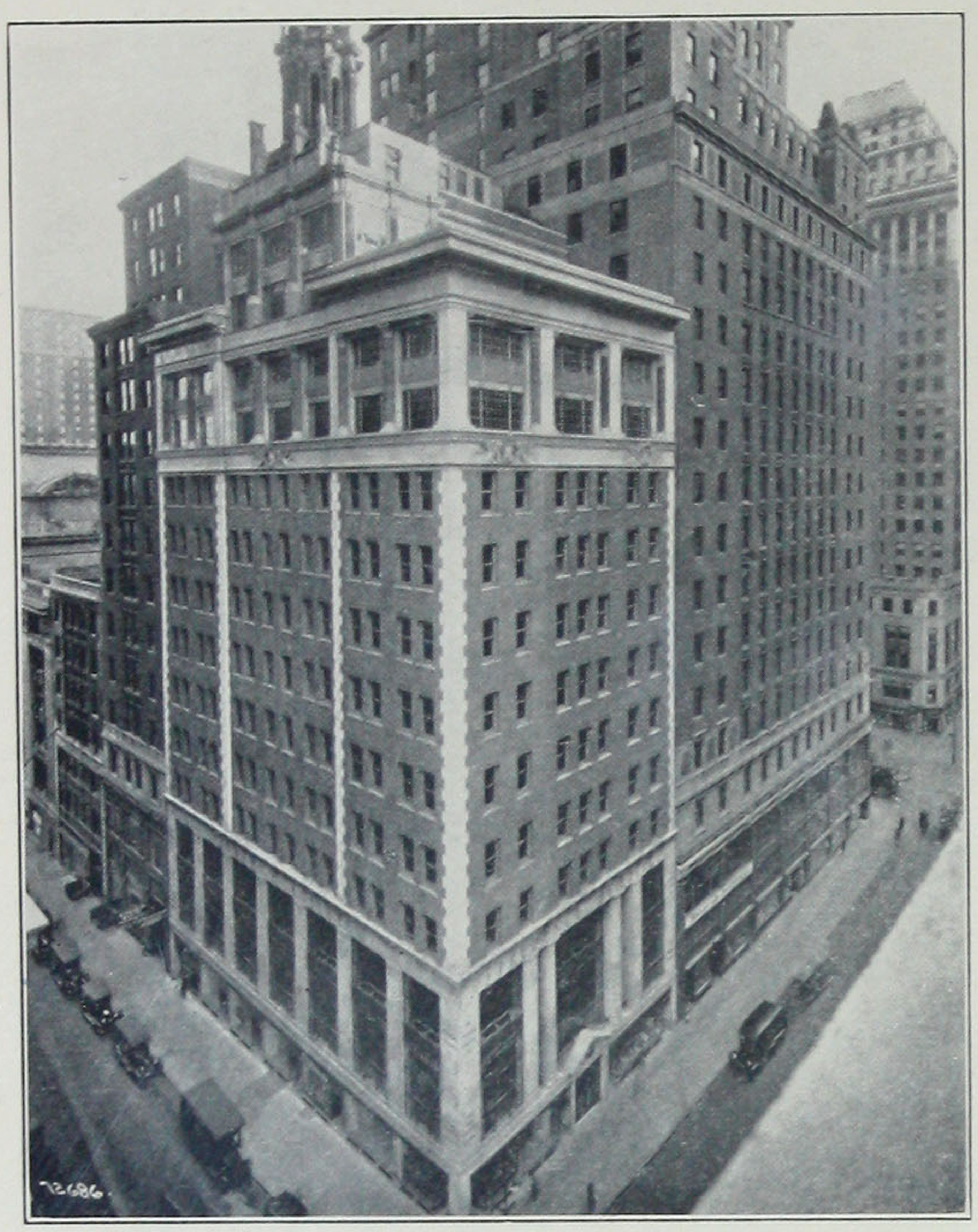
Typical Rivet-Grip Installations



RIVET-GRIP SYSTEM REINFORCEMENT VERTICAL **TYPE B-663-2½"** SPACING OF FRAMES ERECTED COMPLETE IN WALLS OF LOWER STORY OF A TWO STORY VAULT, READY FOR OUTSIDE FORMS AND CONCRETE

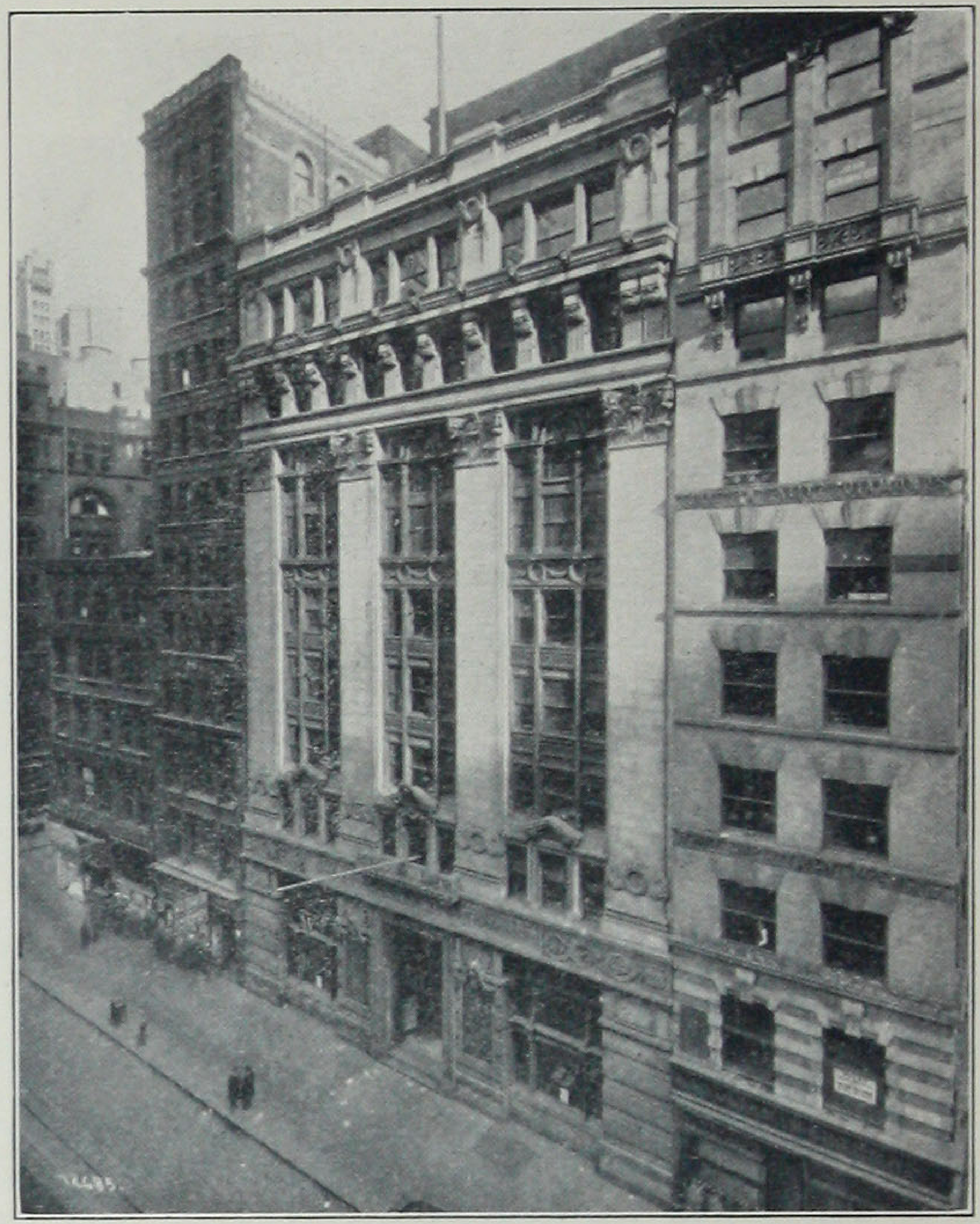


RIVET-GRIP SYSTEM REINFORCEMENT VERTICAL **TYPE B-763-1½"** SPACING OF FRAMES ERECTED COMPLETE IN WALLS OF LOWER STORY OF TWO STORY VAULT, READY FOR OUTSIDE FORMS AND CONCRETE



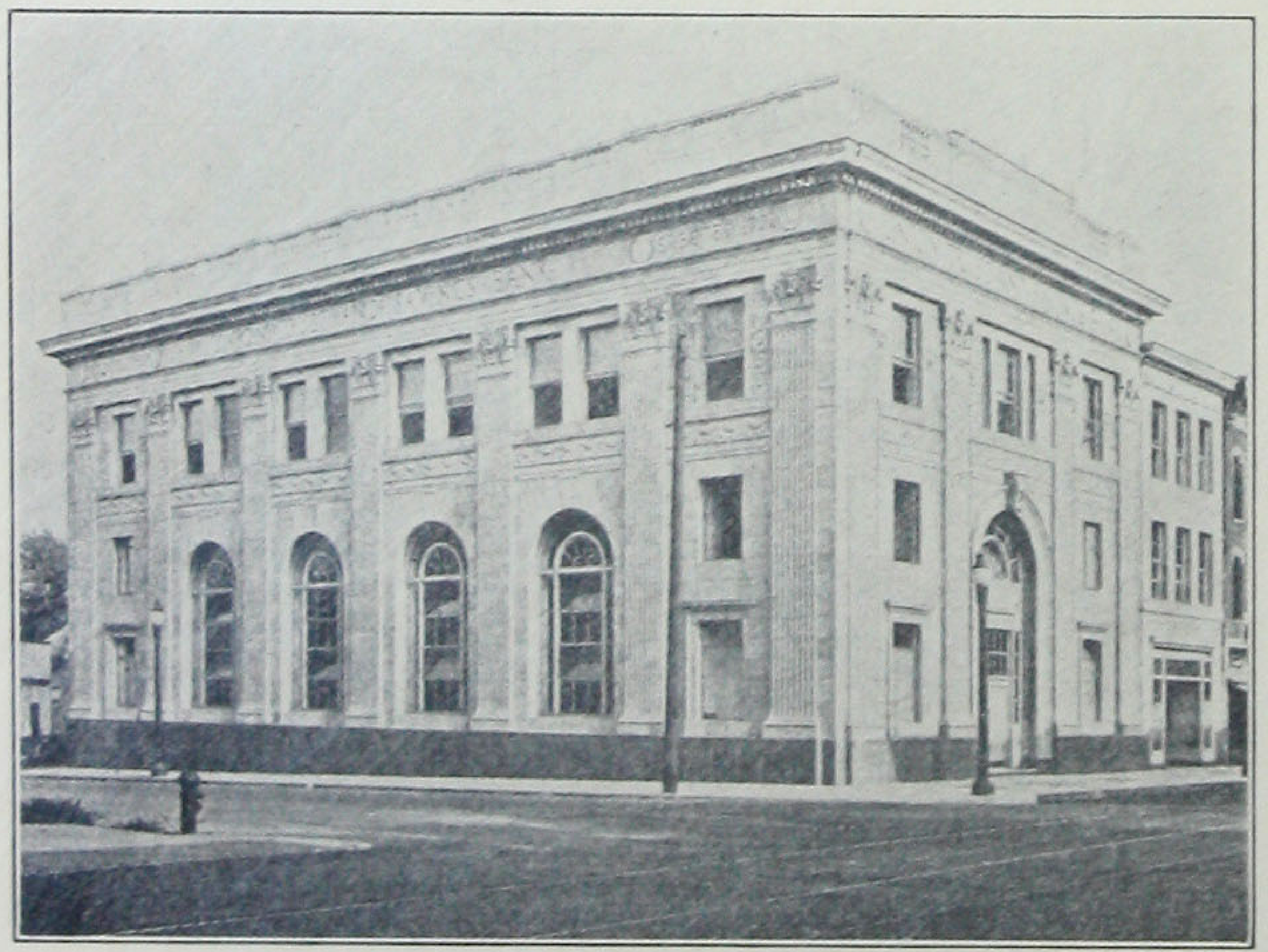
Severance & Van Alen, Architects.

BANK OF MANHATTAN COMPANY
Madison & 43rd Street Branch, New York City



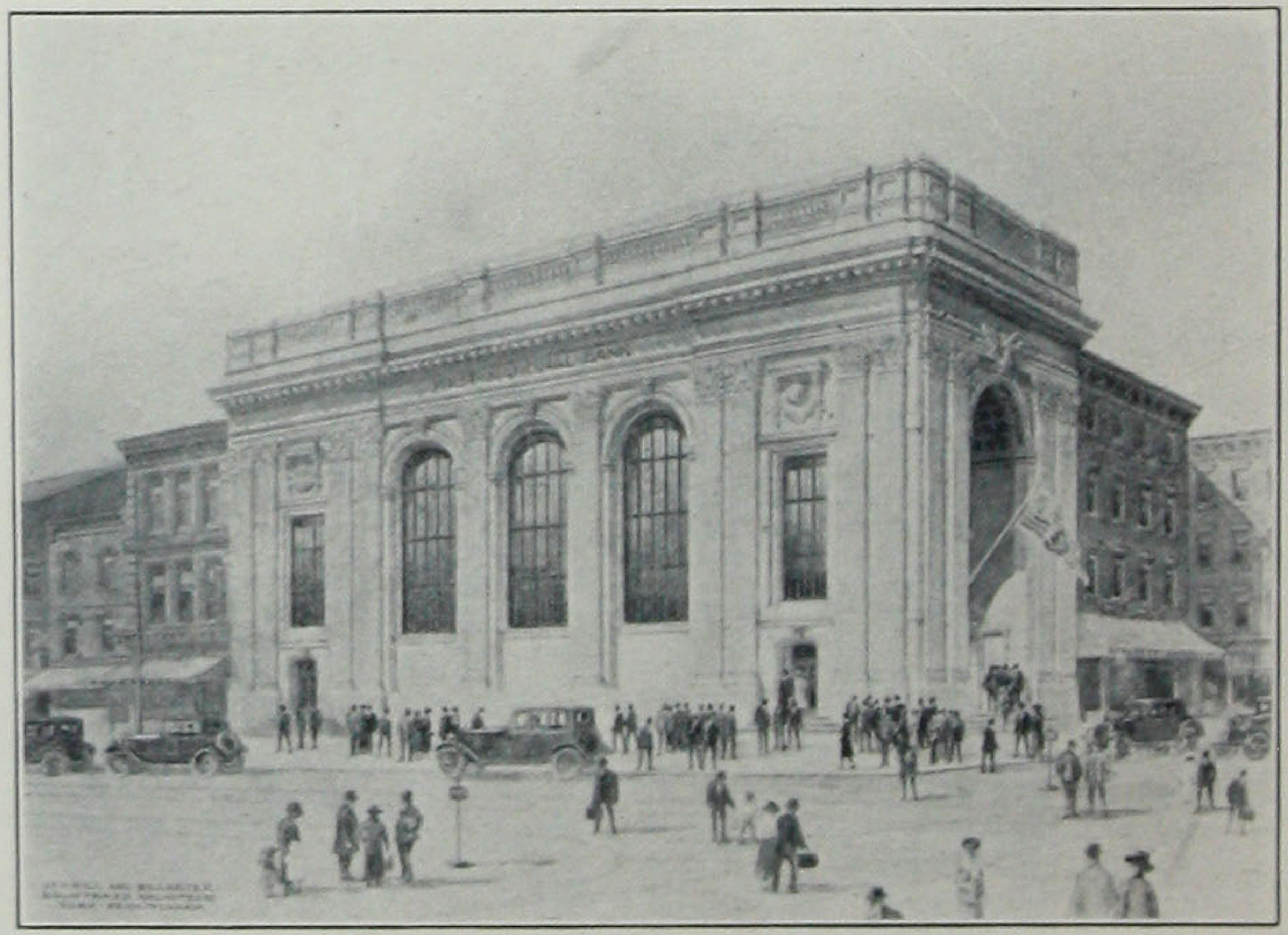
John Mead Howells, Architect
for 20 Story Extension through to Maiden Lane

TITLE GUARANTEE & TRUST CO.
New York City



Weary & Alford, Architects

THE UNION TRUST & SAVINGS BANK
Dubuque, Iowa.

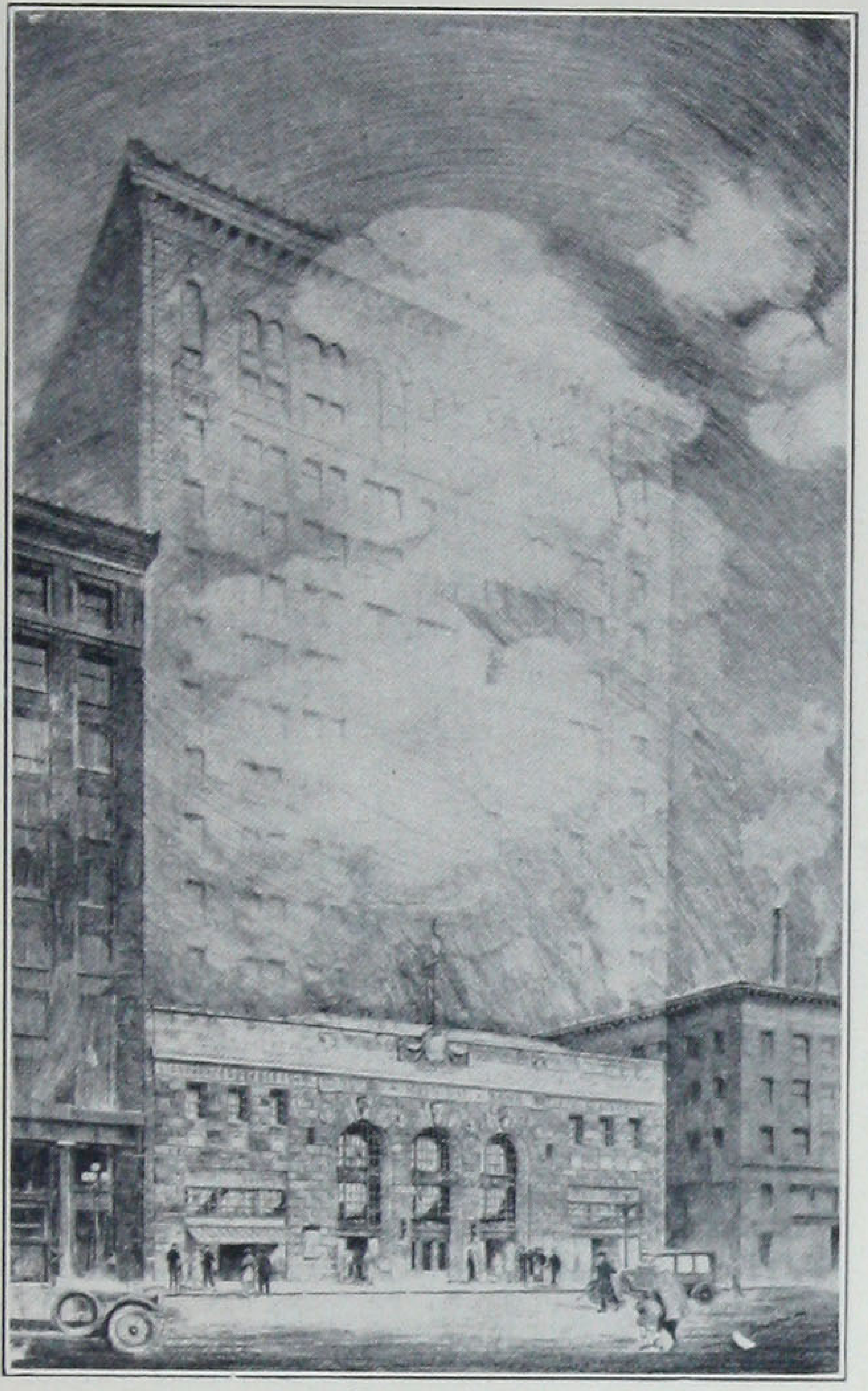


Gemmill and Billmeyer, Architects

THE FIRST NATIONAL BANK
York, Pa.

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

THE RIVET-GRIP SYSTEM OF REINFORCEMENT



Schenk & Williams, Architects

THIRD NATIONAL BANK
Dayton, Ohio.

G G. Elmslie, Architect

CAPITOL BUILDING & LOAN ASSOCIATION
Topeka, Kas.

Press C. Dowler, Architect

BRADDOCK NATIONAL BANK
Braddock, Pa.

Rendigs, Panzer & Martin, Architects

RAILWAY BROTHERHOOD BANK
Cincinnati, Ohio

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

Remarks on Design, Detail, Fabrication and Erection of Rivet-Grip System Reinforcement

RIVET-GRIP SYSTEM reinforcement is specially designed, detailed and fabricated for each individual vault. We furnish complete placing plans showing the exact location of every unit within the entire vault structure.

Before designing the reinforcement for any vault, a comprehensive study and analysis is made of the problem. The same thought and care is exercised in preparing a design, for presentation for preliminary consideration and approval on a projected vault, as for a vault on which a contract is being executed.

Conditions at the building site are taken into consideration when making details and the reinforcement is arranged so as to facilitate erection, keeping in mind however, that protection is always the prime requisite.

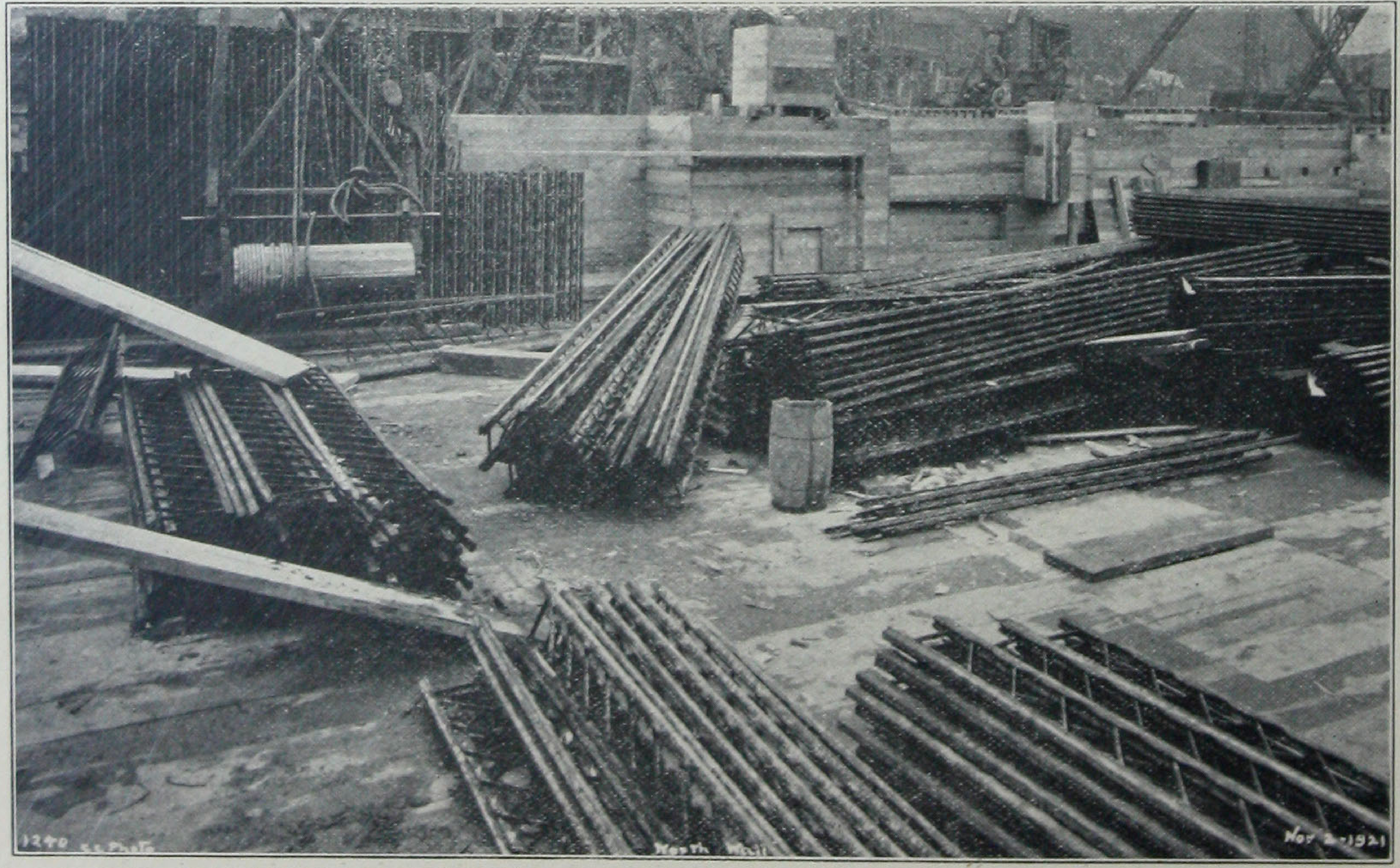
All RIVET-GRIP SYSTEM reinforcement is completely fabricated in our shop. All units are shipped ready to place. No cutting, bending or fitting has to be done at the job. All frames or units are packed in bundles that are convenient to ship, store and handle.

Every frame or unit is given an erection mark which corresponds to the mark shown on the drawings furnished by us. These marks are placed on permanent tags which are attached to all reinforcement.

Any ordinary intelligent steel worker or other individual can place the RIVET-GRIP reinforcement by observing the erection marks and following the drawings. No special skill, training, tools or equipment are required. As shown in the illustrations of the reinforcement, the frames are clean cut and shaped so that they are easy to handle. There are no sharp or ragged edges on any of the sections which make up the frames.

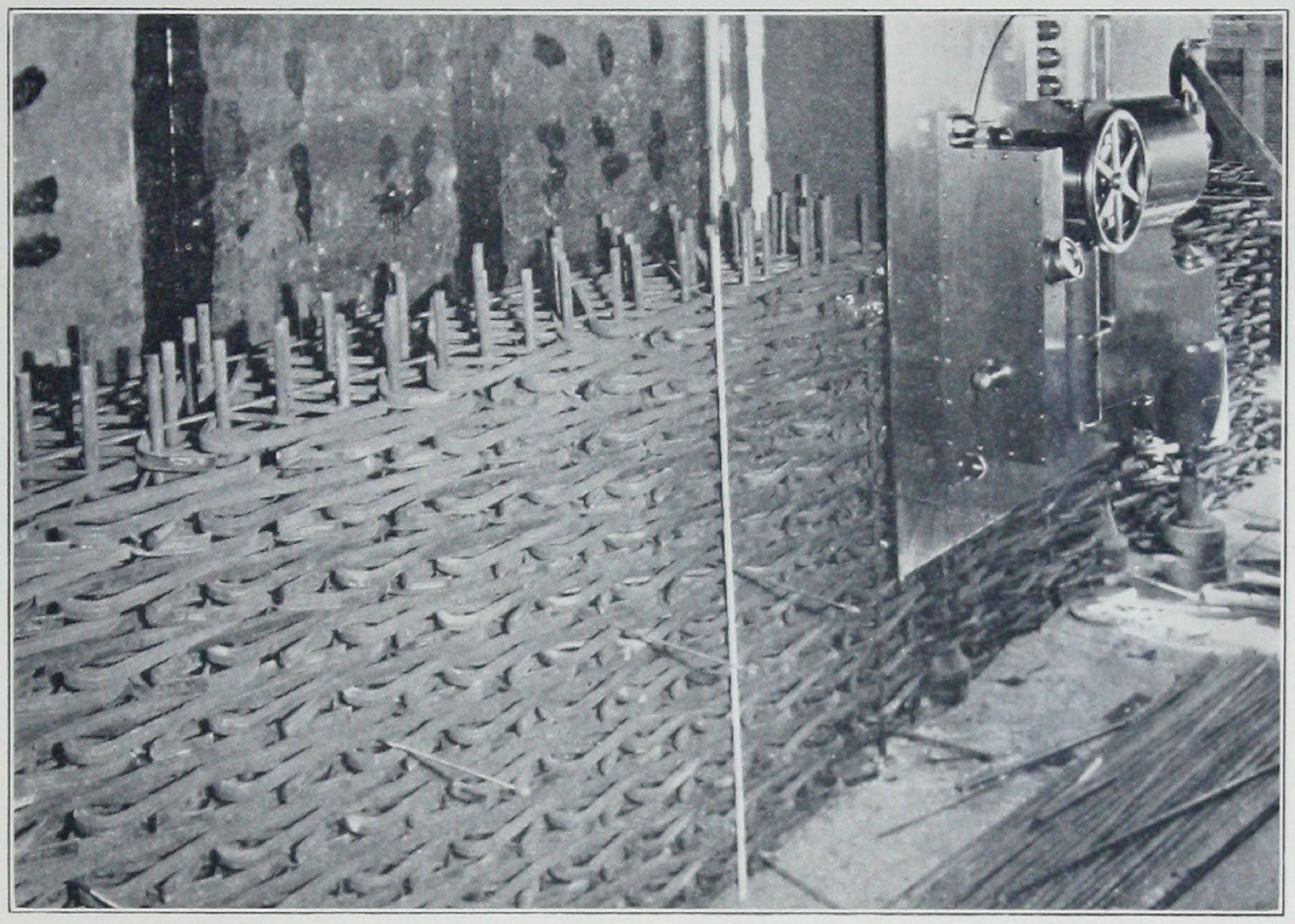
Our experience shows that it requires from five to eight man-hours of direct labor per ton to unload RIVET-GRIP SYSTEM reinforcement from trucks at the building site and place it into its proper position in the vault. These figures apply where the vault is accessible in a new building under construction. Where the vault is installed in an old building in connection with alterations about two hours of additional labor per ton are required.

Generally speaking, less labor per ton of material is required to install the heavier types or closer spacings of reinforcement than is required for the lighter types or wider spacings. The cost of hauling and placing RIVET-GRIP SYSTEM vault reinforcement usually is less than 2/3 the prevailing cost of placing loose bar reinforcement in the localities under consideration.



RIVET-GRIP SYSTEM VAULT REINFORCEMENT ON THE JOB, DURING ERECTION. NOTE STRAIGHT AND CLEAN CUT FABRICATION. FRAMES ARE CONVENIENT TO HANDLE, EITHER SINGLY OR IN BUNDLES.

Horizontal Type Rivet-Grip System Reinforcement for Very Heavy Construction

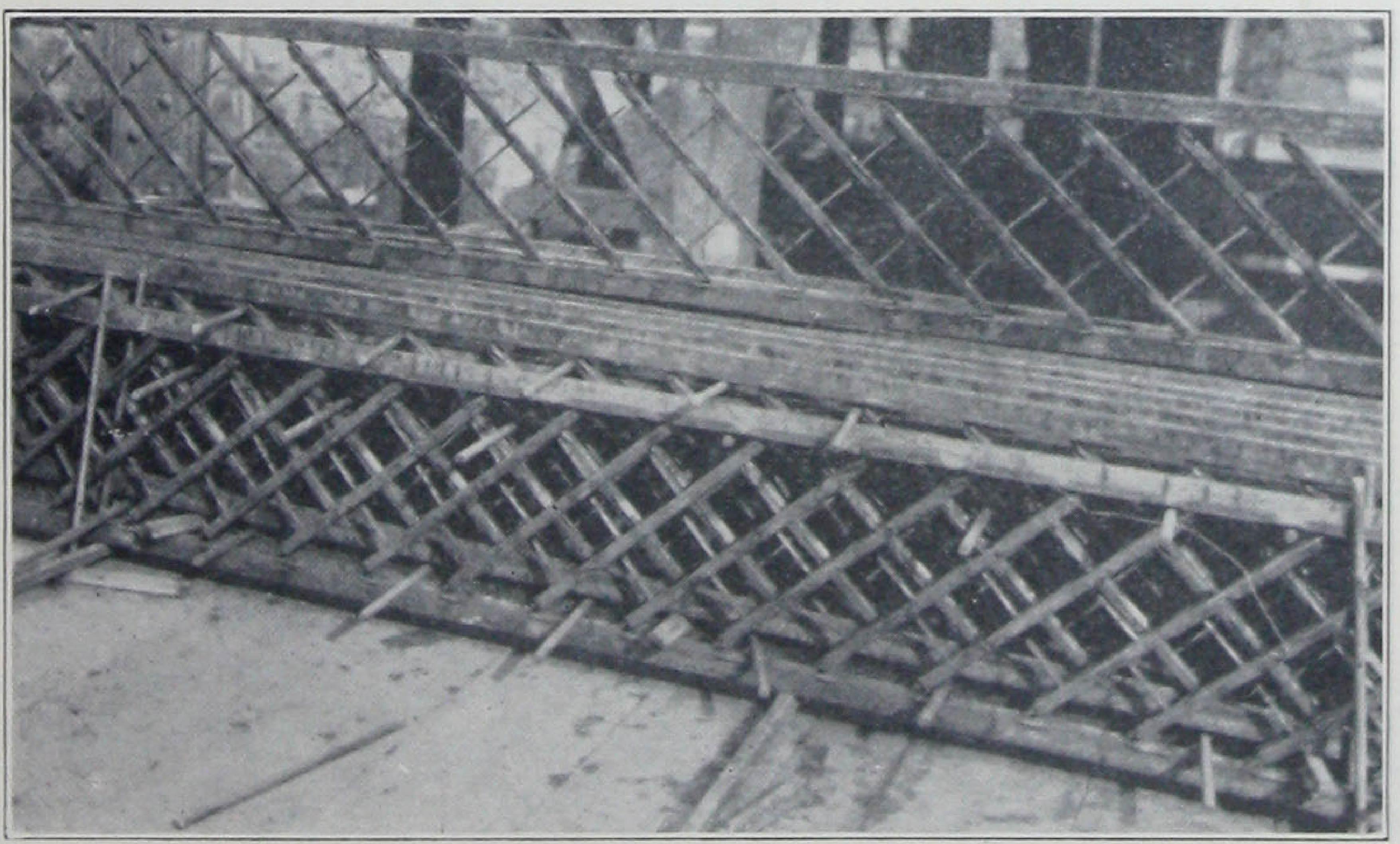


RIVET-GRIP SYSTEM HORIZONTAL TYPE REINFORCEMENT IN 30″ WALL USED IN CONNECTION WITH 30″ DOORS. EMERGENCY DOOR ONLY IS SHOWN IN ILLUSTRATION. NOTE THAT LINING IS USED AS INSIDE FORMWORK FOR CONCRETE

RIVET-GRIP Horizontal type bank vault reinforcement is designed and fabricated for use, in walls from 27″ to 60″ in thickness, and in connection with vault doors ranging from 18″ to 48″ in thickness. Two exceptionally strong vaults have been built in which both horizontal and vertical types of RIVET-GRIP Reinforcement were combined in a total wall thickness of 78″.

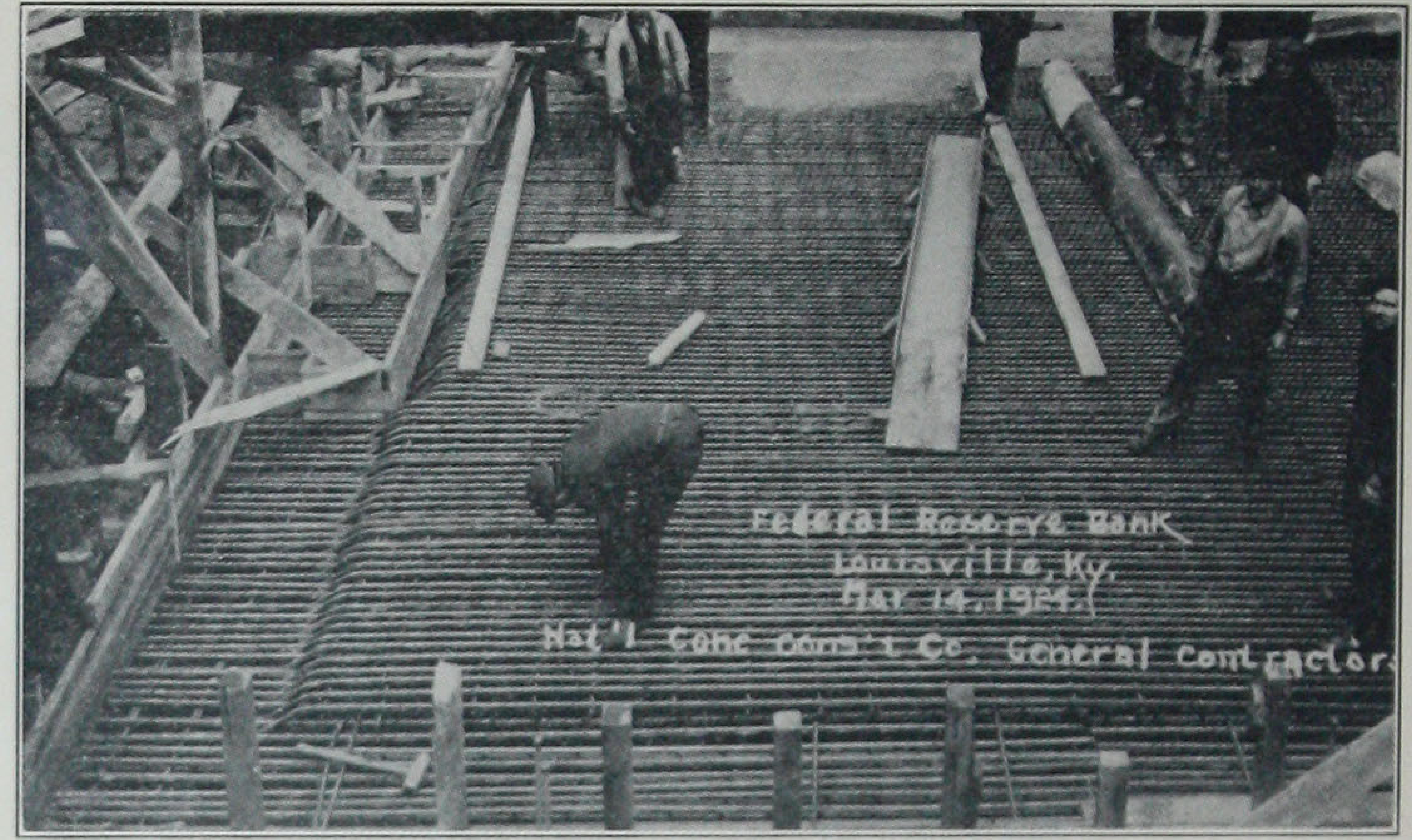
The horizontal type in walls consists of RIVET-GRIP frames, similar in appearance to sled runners. These frames are laid flat in rows with bent ends at the outside face of wall. The axis of every frame is inclined at 45° to the face of the wall and the frames in alternating rows are at 90° to each other. Between adjacent rows of frames there are two flat steel separators, both parallel to the wall. Heavy bars are inserted vertically in the pockets formed between intersecting bars and stirrups. The pockets between intersecting bars and stirrups are about 4″ square and are large enough to allow the free pouring of concrete.

The horizontal type in top or middle slabs consist of special heavy RIVET-GRIP frames placed horizontally on edge. The frames have heavy bars for the diagonals in place of the regular diagonal members. The heavy



RIVET-GRIP SYSTEM Horizontal Type Reinforcement in 30″ top slab or roof **of vault. The single frame, on top of the reinforcement that is in place, shows clearly the details of the heavy side slabframes used in horizontal type construction.**

Horizontal Type (Continued)

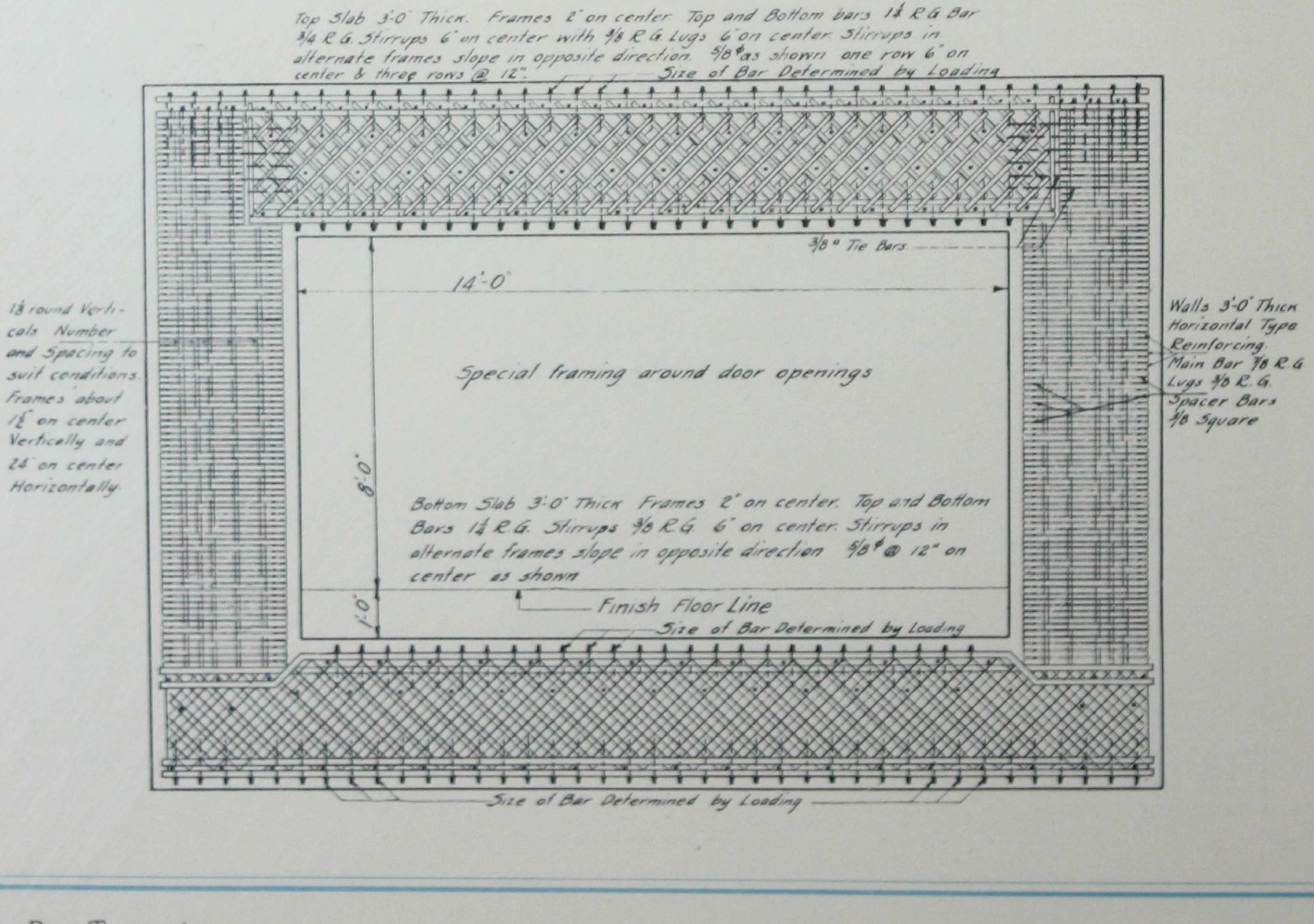


RIVET-GRIP SYSTEM Horizontal Type reinforcement in 30″ bottom slab or floor of vault. This illustration shows clearly the offset in the bottom slab reinforcement just inside of the wall intersection.

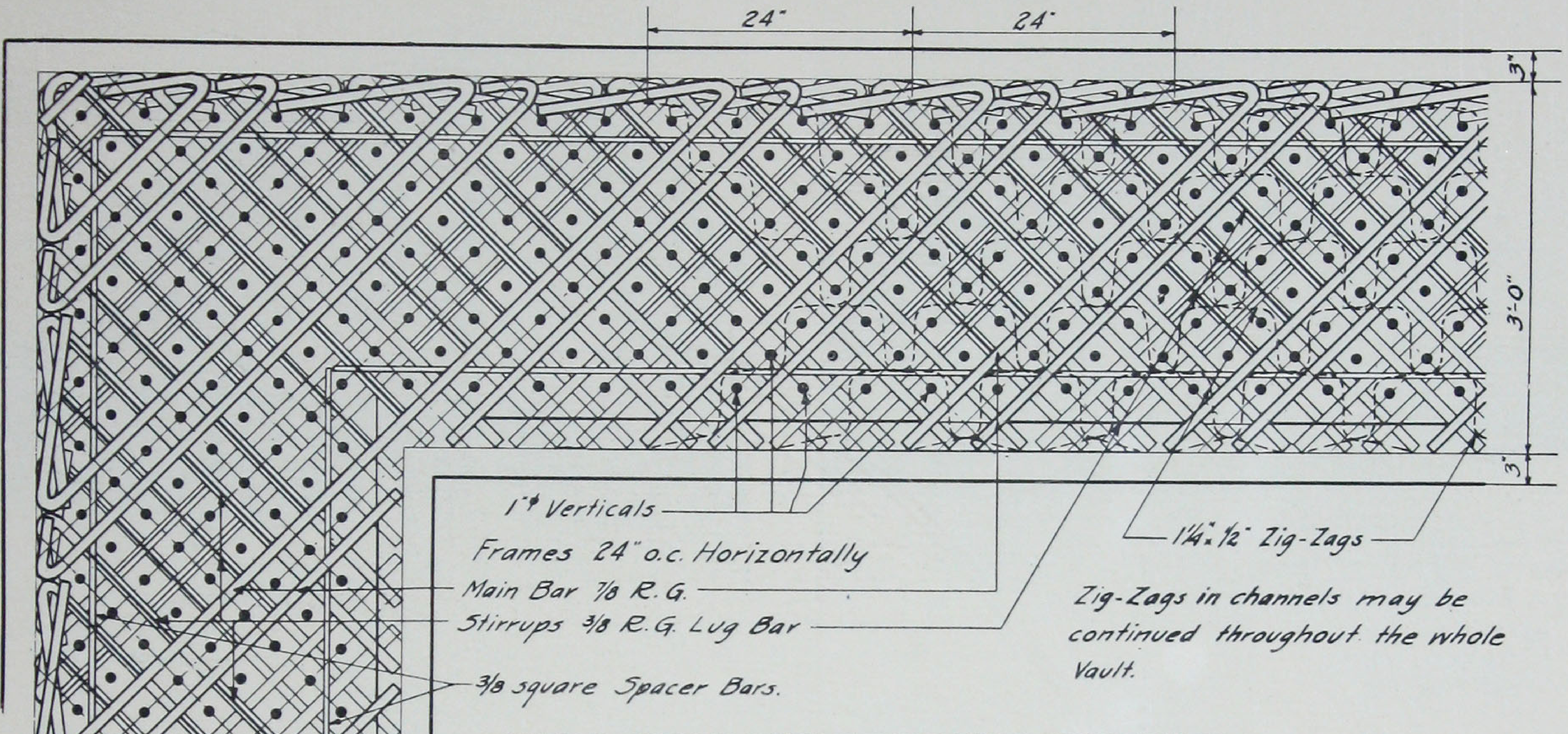
diagonals are secured to the main sections by means of short lengths of regular diagonal sections which are gripped to both the main and diagonal sections. The space between the heavy diagonals is effectively blocked by short lengths of stirrups gripped to and extending at right angles from the diagonals. These frames are placed side by side in the slab just touching each other. Round bars are inserted at right angles to the webs of the frames near the top and bottom of the slab.

The horizontal type in bottom slabs consists of RIVET-GRIP frames placed horizontally on edge. These frames are generally placed almost touching each other. Half of the bottom slab frames are specially detailed so as to form an offset around the vault just inside of the wall intersection. This offset or shoulder on the bottom slab allows the wall reinforcement to begin below the level of the top of the bottom slab. Round bars are inserted at right angles to the webs of the frames near the top and bottom of the slab.

The typical section shown below illustrates the details of the interlocking of members at wall and slab intersections.

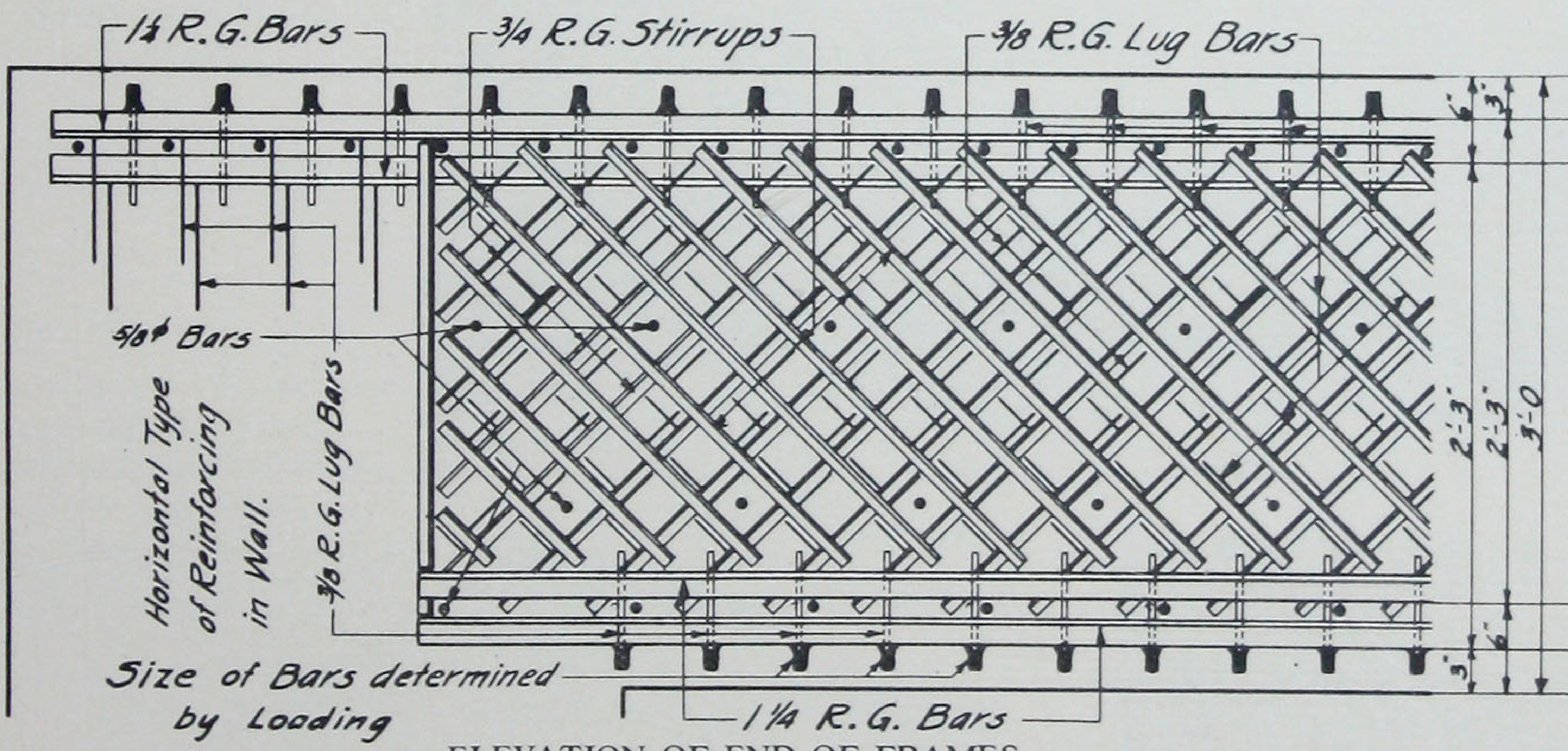

Top Slab 3'-0" Thick. Frames 2" on center. Top and Bottom bars 1¼ R G Bar 3/4 R.G. Stirrups 6" on center with 3/8 R.G. Lugs 6" on center. Stirrups in alternate frames slope in opposite direction. 5/8ϕ as shown one row 6" on center & three rows @ 12".
Size of Bar Determined by Loading
3/8" Tie Bars
14'-0"
1⅛ round Verticals Number and Spacing to suit conditions. Frames about 12" on center Vertically and 24" on center Horizontally.
Walls 3'-0" Thick Horizontal Type Reinforcing. Main Bar 7/8 R.G. Lugs 3/8 R.G. Spacer Bars 3/8 Square
Special framing around door openings
8'-0"
Bottom Slab 3'-0" Thick Frames 2" on center. Top and Bottom Bars 1¼ R.G. Stirrups 3/8 R.G. 6" on center. Stirrups in alternate frames slope in opposite direction 5/8ϕ @ 12" on center as shown
1'-0"
Finish Floor Line
Size of Bar Determined by Loading
Size of Bar Determined by Loading

Details of the Rivet-Grip System—Horizontal Type

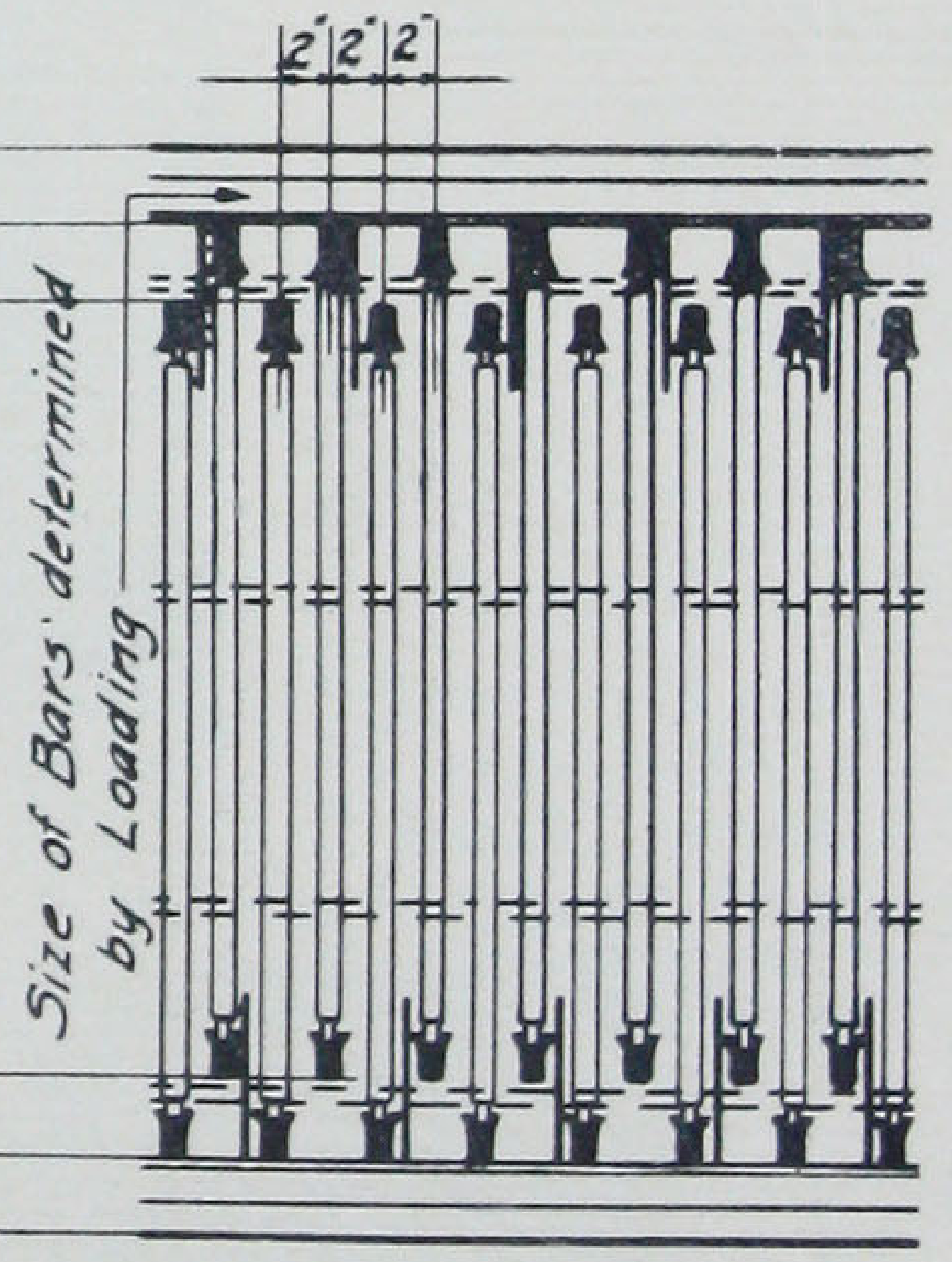

24"
24"
3"
3'-0"
3"
1"ϕ Verticals
Frames 24" o.c. Horizontally
Main Bar 7/8 R.G.
Stirrups 3/8 R.G. Lug Bar
3/8 square Spacer Bars.
1¼"x½" Zig-Zags
Zig-Zags in channels may be continued throughout the whole Vault.

TYPICAL CORNER INTERSECTION WALL—TYPE HW-773

Type	Main Bars	Stirrups	Hor. Spacing of Frames	Vert. Spacing of Frames	Spacers	Vertical Bars	Zigzags	Thickness of Wall
HW—773	⅞″	⅜″	24″	1½″	⅜″ R. G.	1″ Rd.	½″x1¼″ Flat	36″ to 60″
HW—663	¾″	⅜″	24″	1½″	⅜″ R. G.	1″ Rd.	½″x1¼″ Flat	27″ to 42″



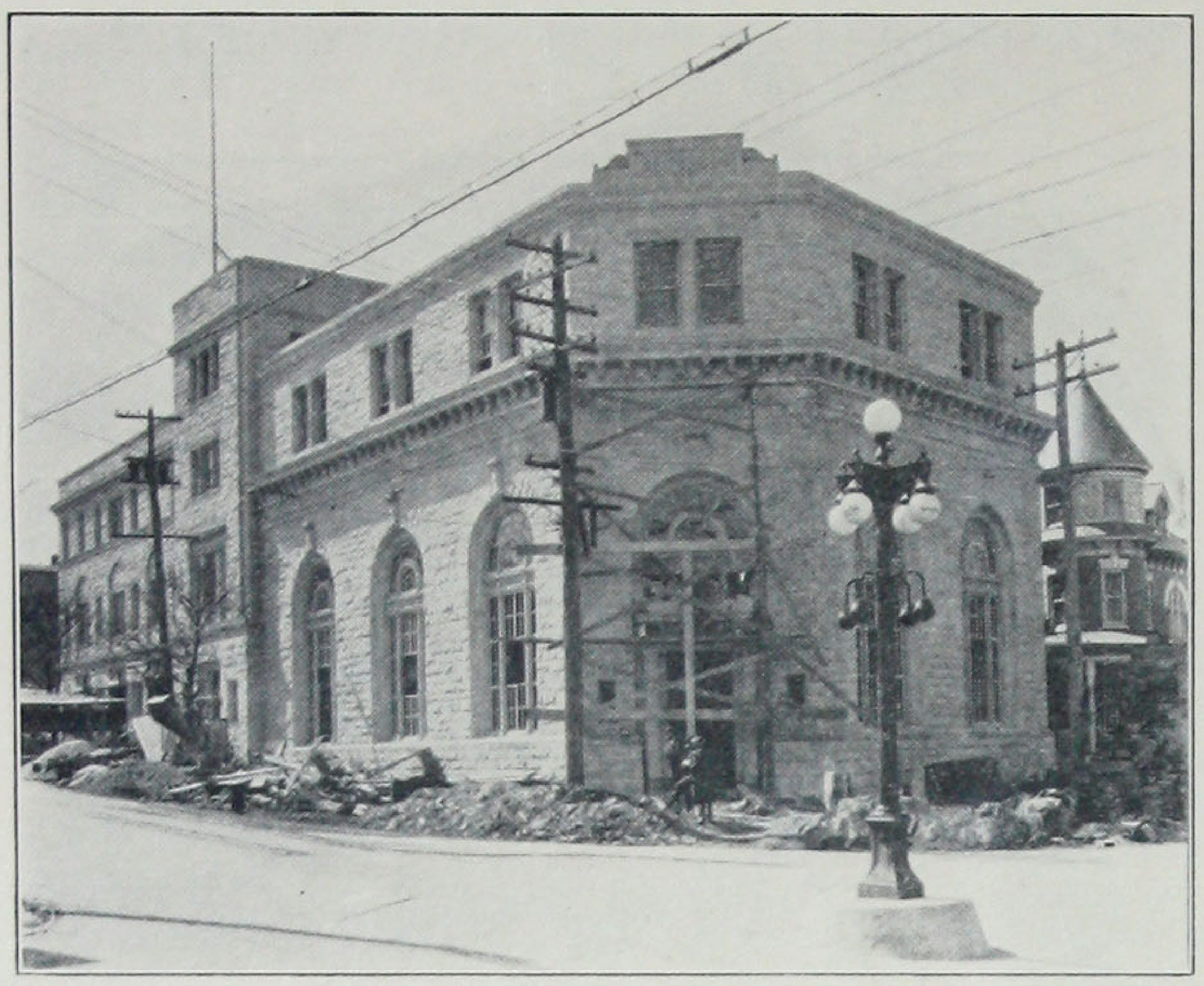
ELEVATION OF END OF FRAMES



SECTION

Typical Slab—Type HS-1063-2″

Type	Main Bars	Stirrups	Spacing of Frames	Top Hor. Bars	Bott. Hor. Bars	Thickness of Slab	Spacer Bar
HS—1063	1¼″	¾″–⅜″	2″	¾″Rd.6″o.c.	¾″Rd.12″o.c.	36″ to 60″	Size and spacing determined by structural conditions.
HS— 963	1⅛″	¾″–⅜″	2″	¾″Rd.6″o.c.	¾″Rd.12″o.c.		
HS— 863	1″	¾″–⅜″	2″	¾″Rd.6″o.c.	¾″Rd.12″o.c.		
HS— 953	1⅛″	⅝″–⅜″	2″	¾″Rd.6″o.c.	⅝″Rd.12″o.c.	27″ to 42″	
HS— 853	1″	⅝″–⅜″	2″	¾″Rd.6″o.c.	⅝″Rd.12″o.c.		



J. A. Dempwolf, Architect

RED LION FIRST
NATIONAL BANK
Red Lion, Pa.

THE FIRST-COLUMBIA
NATIONAL BANK
Columbia, Pa.

*Benjamin Rush Stevens,
Architect*

ASHLAND
NATIONAL BANK
Ashland, Pa.

Melvern R. Evans, Architect

CONESTOGA
NATIONAL BANK
Lancaster, Pa.

Millot & Parker, Architects

THE COMMERCIAL
BANKING & TRUST CO.
Sandusky, Ohio

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

THE RIVET-GRIP SYSTEM OF REINFORCEMENT

Mowbray & Uffinger' Architects

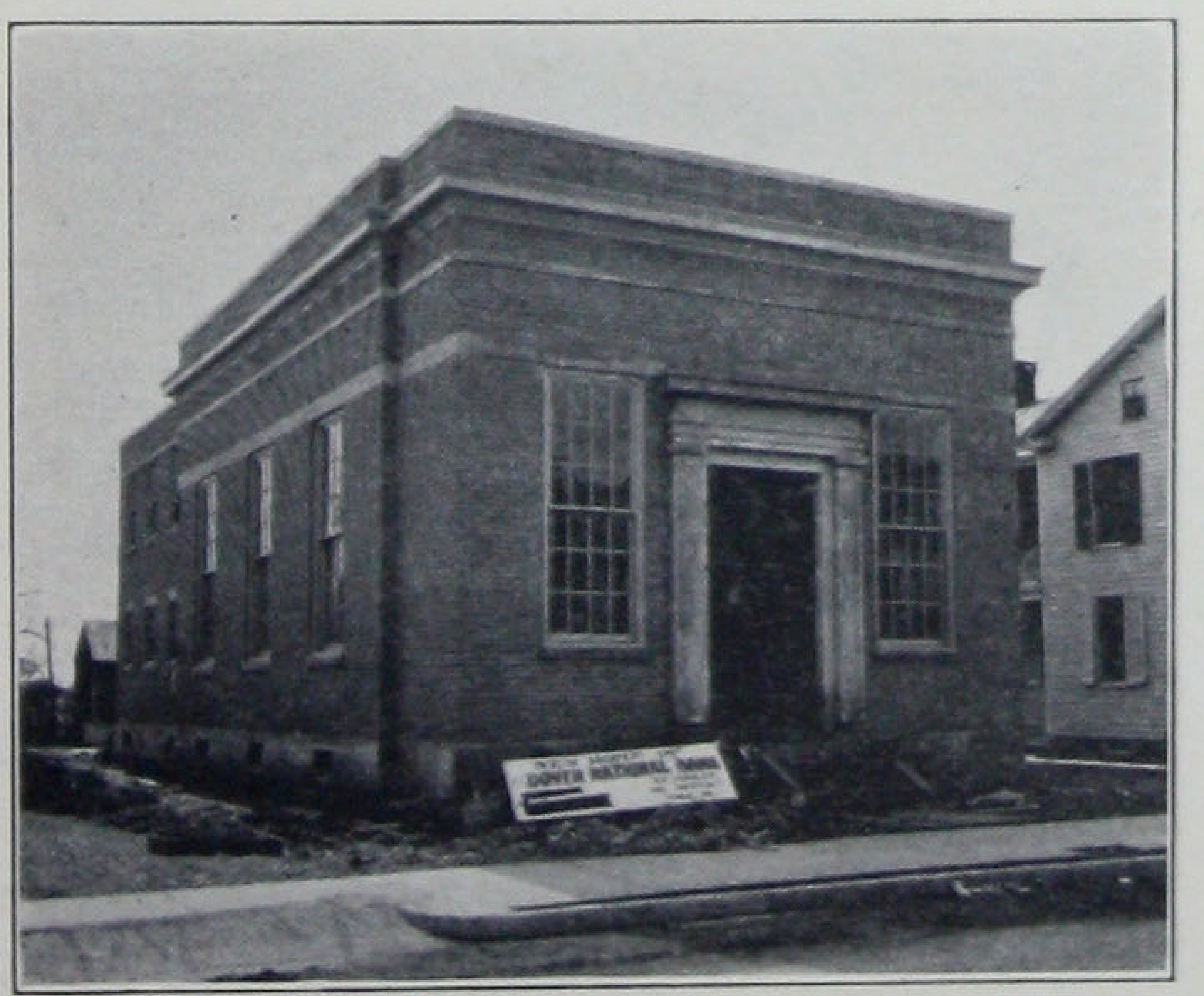
FIRST NATIONAL BANK
East Liverpool, Ohio

C. Howard Lloyd, Architect

MECHANICS TRUST CO.
Harrisburg, Pa.

Hoggson Brothers, Architects

THE SECOND NATINOAL BANK
Mechanicsburg, Pa.



H. E. Yessler, Architect.

DOVER NATIONAL BANK
Dover, Pa.

FIRST NATIONAL BANK
Fairfield, Pa.

The RIVET-GRIP SYSTEM is installed in the vaults of the above banks.

Burglary Insurance and the Rivet-Grip System

Even though a bank carries full insurance against financial loss from vault burglary, it is still absolutely essential to have the physical protection of a strong vault which will resist every form of attack.

The present remarkable and rapid development of the Safe Deposit business makes it more imperative than ever that the vast treasures, deposited for safe keeping, be adequately protected.

WHAT BURGLARY INSURANCE WILL DO

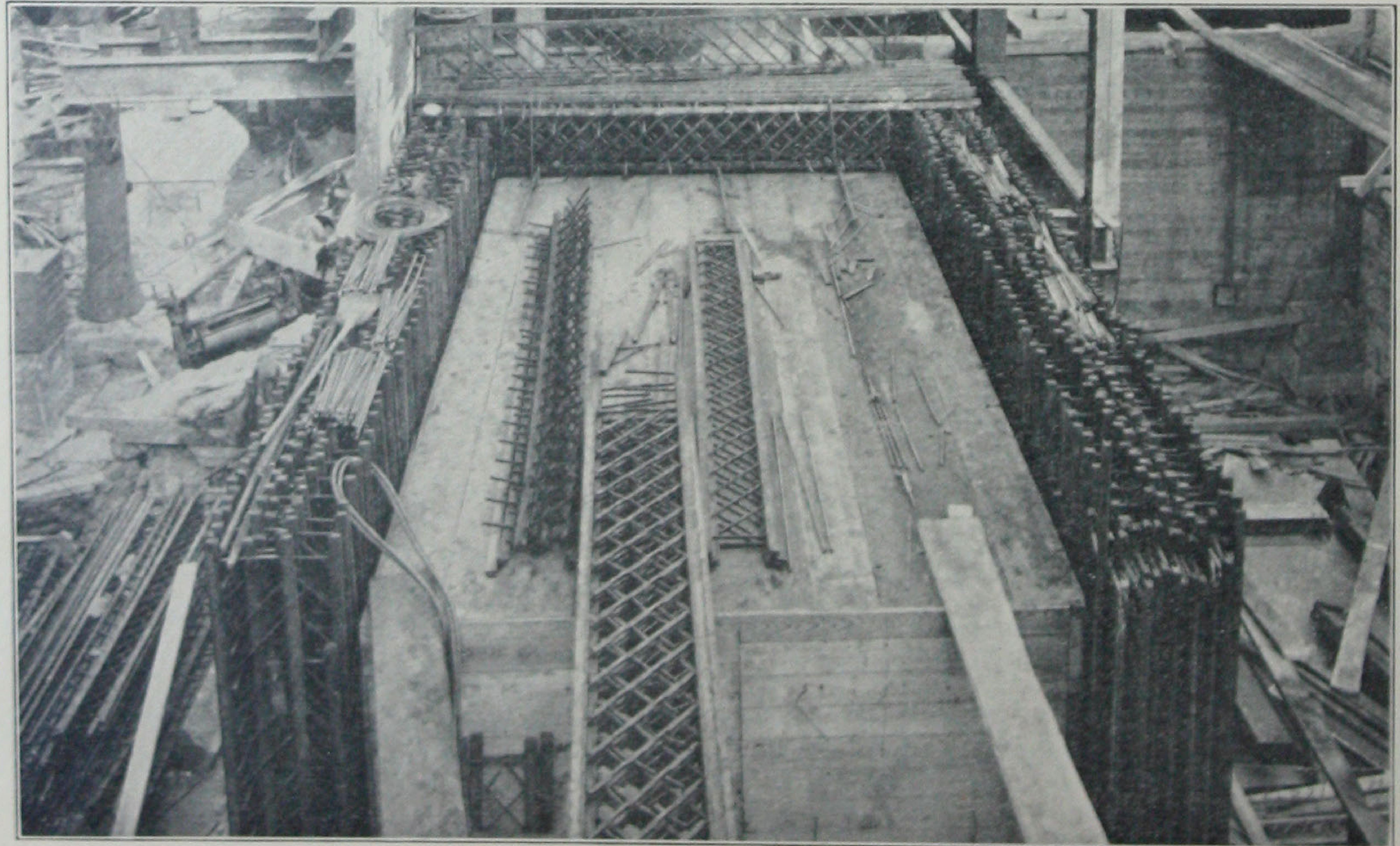
1. Burglary insurance can only give financial reimbursement for the actual monetary value of the property removed.

WHAT BURGLARY INSURANCE WILL NOT DO

1. Burglary insurance cannot actually replace treasured jewe heirlooms or valuable documents.
2. It does not prevent undesirable publicity or loss of prestige, should a vault be entered, even though nothing of value is obtained.
3. It will not prevent the loss of public confidence in the security of a bank, if its vaults are successfully burglarized.
4. It will not restore the bank in entire public esteem and confidence even though all losses are fully repaid.
5. It cannot reimburse the bank for loss of business or checking of growth following reports of a burglary.
6. It does not relieve the banker of the moral responsibility of providing the most modern and secure vault obtainable for the safe keeping of his client's and his own valuables.

General recognition by bankers of the above statements is proven by the fact that hundreds of banks throughout the country have lately been constructing vaults whose strength is far beyond the requirements of the Insurance Underwriters. It is not uncommon for banks to purchase vault doors up to twenty or more inches in thickness, along with adequate RIVET-GRIP SYSTEM reinforcement for their walls, although the lowest possible insurance rates apply to any door ten inches in thickness.

Vaults with RIVET-GRIP SYSTEM walls, with or without linings, receive the highest classifications from Insurance Underwriters and take the lowest insurance rates. A strong modern vault with fine heavy doors and RIVET-GRIP SYSTEM walls, floor and roof, backed up by a steel lining is the finest kind of super-insurance that any bank can have and is an investment due every client and depositor.



AN EXCEPTIONALLY STRONG VAULT IN WHICH RIVET-GRIP SYSTEM TYPE B-873-1½" SPACING OF FRAMES WAS USED IN 24" WALLS AND SLABS IN CONJUNCTION WITH 20" DOORS

Suggested Specifications for Rivet-Grip System Reinforcement

REINFORCEMENT

The reinforcement shall be the "RIVET-GRIP SYSTEM of Bank Vault Reinforcement" consisting of special shop-fabricated steel frames and plain round bars as produced by The Rivet-Grip Steel Company, Cleveland, Ohio. All steel to be of structural grade, conforming to Standard Specifications of the American Society for Testing Materials.

The arrangement of RIVET-GRIP frames and plain round bars shall conform to that shown on page 17 of the manufacturers' catalogue for Type-------------- spacing of frames. The reinforcement shall be detailed for walls------inches, floor slab------inches, and roof slab------inches thick. Plain round bars 5/8″ in diameter shall be laced horizontally through the webs of the frames at 6 inches on centers near outside face, (------inches on centers in middle), and 12 inches on centers near inside faces of walls or slabs.

All units shall interlock at all intersections of walls, and of walls and slabs, and special provision shall be made at door openings to strengthen the connections between door frames and vestibules and the reinforced concrete walls.

All units shall be completely shop fabricated and shipped ready to place. They shall all be tagged with an erection mark corresponding to the marks on the drawings furnished by the manufacturer.

NOTE.—This specification applies only to the Vertical Type—Specifications covering our Horizontal Type are specially written for each individual vault and are furnished on application

DRAWINGS

The Rivet-Grip Steel Company shall furnish complete placing drawings showing the exact location of each frame and spacer bars. Two sets of prints of approved placing plans and details shall be furnished for use in placing steel.

FORMS

All forms shall be true and rigid and shall be sufficiently tight to prevent leakage of mortar, and they shall be so constructed as to be readily cleaned, accessible for inspection and removal. All debris shall be cleaned out before pouring concrete.

CONCRETE

Proportions. The concrete for vault masonry construction shall be proportioned of one part Portland cement, two parts sand, and three and one-half parts quartz gravel or crushed stone.

Mixing. The concrete shall be mixed in a mechanical batch mixer and shall be of such consistency as to flow easily (but should not be so wet that there is a tendency for the coarse aggregate to separate.)

Cement. Shall conform to requirements of Standard Specifications for cement as adopted by American Society for Testing Materials. The cement as proportioned above may contain 10% of hydrated lime.

Sand. The sand shall be clean, silaceous sand and shall not contain over 3% of loam.

Gravel. Gravel shall be clean, hard and free from dust and dirt and of such size as to pass thru a 5/8″ ring. Twenty-five percent of the whole shall not be more than one-half maximum size.

Stone. Stone shall be clean, hard and free from dust and dirt and of such size as to pass thru a 3/4″ ring. Twenty-five percent of the whole shall not be more than one-half maximum size.

NOTE—The use of crushed stone is not recommended where frames are spaced closer than 2″ on centers.

Some Recent Rivet-Grip Installations

FEDERAL RESERVE BANKS

Cleveland Federal Reserve Bank.
Pittsburgh Branch of the Federal Reserve Bank of Cleveland.
San Francisco Federal Reserve Bank
St. Louis Federal Reserve Bank
Louisville Branch of the Federal Reserve Bank of St. Louis
Little Rock Branch of the Federal Reserve Bank of St. Louis.
Minneapolis Federal Reserve Bank

OTHER BANKS

Bank of America
New York, N. Y.

Title Guarantee & Trust Co.
New York, N. Y.

Commonwealth Bank
New York, N. Y.

Andover Bank
Andover, Ohio

East Side Savings Bank
Rochester, N. Y.

First National Bank
Salem, Ohio

Thurmont Bank
Thurmont, Md.

Commercial & Savings Bank
Berea, Ohio

American Security & Trust Co.
Washington, D. C.

Reeves Banking & Trust Co.
Dover, Ohio

Terre Haute Trust Company
Terre Haute, Ind.

Cleveland Heights Building & Loan Co.
Cleveland Heights, Ohio

Peoples Bank
Waukegan, Ill.

Otis & Company
Cleveland, Ohio

First National Bank
Blairsville, Pa.

Union Banking Company
Columbiana, Ohio

American National Bank
Shreveport, La.

Corn Exchange Bank
(Jamaica Branch)
Jamaica, Long Island

Bank of Manhattan
(43rd & Madison Branch)
New York, N. Y.

Cleveland Trust Company
Cleveland, Ohio

First State Bank
Bellmont, Ill.

Atlantic National Bank
Charleston, S. C.

Harbor Building & Loan Assoc.
Ashtabula Harbor, Ohio

Farmers & Workingmens Bank
Jackson, Mich.

Harvard Savings & Loan Co.
Cleveland, Ohio

Highland Park State Bank
Highland Park, Ill.

Commercial Banking & Tr. Co.
Sandusky, Ohio

Ashland National Bank
Ashland, Pa.

United Bank
Cleveland, Ohio

First National Bank
Mt. Carmel, Ill.

Commercial Savings & Loan Co.
Cleveland, Ohio

Security Trust Company
Rochester, N. Y.

Citizens Trust Co.
Canonsburg, Pa.

Discount Corp'n of New York
New York, N. Y.

Corn Exchange Bank
(72nd Street Branch)
New York, N. Y.

Union Trust Bank,
Cincinnati, Ohio

Athens Bank
Athens, Ohio

Union Trust & Savings Bank
Dubuque, Iowa

Geo. D. Harter Bank
Canton, Ohio

First National Bank
Waterloo, N. Y.

Third National Bank
Dayton, Ohio

Conestoga National Bank
Lancaster, Pa.

Ohio Mutual Savings & Loan
Cleveland, Ohio

Bank of Manhattan Company
(Metropolitan Ave. Branch)
New York, N. Y.

National Bank of Toronto
Toronto, Ohio

First National Bank
Fairfield, Pa.

Farmers Bank of Cleveland
Cleveland, Ohio

Capitol Building & Loan Assoc.
Topeka, Kansas

First National Bank
Bellevue, Ohio

Security Trust Co.
Detroit, Mich.

Mellon National Bank
Pittsburgh, Pa.

Home Savings Bank
Toledo, Ohio

Exchange National Bank
Pittsburgh, Pa.

American Trust & Savings Bank
Evansville, Ind.

Lincoln Hts. Savings & Loan
Cleveland, Ohio

Braddock National Bank
Braddock, Pa.

Lake Erie Trust Company
Cleveland, Ohio

First National Bank
Angola, Ind

Geneva Savings Bank Co.
Geneva, Ohio

Dover National Bank
Dover, Pa.

City Savings & Loan Co.
Cleveland, Ohio

State Banking & Trust Co.
Cleveland, Ohio

Fairbury Bank
Fairbury, Ill.

Wright Banking Company
Bellevue, Ohio

First National Bank
York, Pa.

Merchants Sav. & Banking Co.
Cleveland, Ohio

Buckeye Commercial Sav. Bank
Findlay, Ohio

Spang-Chalfant Bank
Pittsburgh, Pa.

First National Bank
Bellevue, Ohio

Guardian Sav. & Trust Co.
(E. 105th & Euclid Branch)
Cleveland, Ohio

Bank of New York & Trust Co.
New York, N. Y.

Guardian Savings & Trust Co.
Cleveland, Ohio

Union Trust Company
(Broadway Office)
Cleveland, Ohio

First National Bank
Chardon, Ohio

Union Trust Company
(Woodland Office)
Cleveland, Ohio

Red Lion First National Bank
Red Lion, Pa.

Second National Bank
Warren, Ohio

Kingston Trust Company
Kingston, N. Y.

Northern National Bank
Cleveland, Ohio

First National Bank
Grove City, Pa.

Elyria Savings & Trust
Elyria, Ohio

Fisher Brothers Vault
Cleveland, Ohio.

Brotherhood of Ry. Clerks Bk.
Cincinnati, Ohio

Guaranty State Sav. & Loan
Cleveland, Ohio

Highland Park State Bank
Highland Park, Ill.

Commonwealth B'k'g & Tr. Co.
Cleveland, Ohio

Lorain County Savings & Trust
Elyria, Ohio

Savings & Loan Banking Co.
New London, Ohio

Citizens Savings Bank
Columbiana, Ohio

Trumbull Savings & Loan
Warren, Ohio

Fremont Savings Bank
Fremont, Ohio

State Banking & Trust Co.
Broadway & E. 55th St. Branch
Cleveland, Ohio.

Society for Savings
Cleveland, Ohio

Cleveland Trust Company
(Lakeshore Branch)
(Cleveland, Ohio

Cleveland Discount Company
Cleveland, Ohio

Peoples Bank & Trust Co.
Mt. Vernon, Ind.

Steubenville Bank & Trust Co.
Steubenville, Ohio

Greenville National Bank
Greenville, Pa.

Bracken Vault
Cleveland, Ohio

Alexander Cappasso
New Haven, Conn.

Commercial Savings Bank
Galion, Ohio

Reliance Trust Company
Cleveland, Ohio

National Bank of Commerce
Lorain, Ohio

Mechanics Trust Company
Harrisburg, Pa.

First National Bank
Elyria, Ohio

Lincoln National Bank
Lincoln, Pa.

Pearl St. Savings & Trust Co.
Cleveland, Ohio

First National Bank
East Liverpool, Ohio

First National Bank
Rocky River, Ohio

First National Bank
Greenville, Pa.

Bank of Berea Company
Berea, Ohio

Guardian Sav. & Trust Co.
(E. 46th Street Branch)
Cleveland, Ohio

Union Bank & Trust Co.
Huntington, W. Va

OUR services are at your disposal. We will be pleased to co-operate with you in arriving at the best, yet most economical solution of your vault problems. We are prepared to give you preliminary designs and estimates on short notice, without obligation.

THE RIVET-GRIP STEEL CO
Formerly The Concrete Reinforcing & Engineering Company
2735 Prospect Avenue CLEVELAND, OHIO

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